SEEDS AND FOOD SECURITY

A Seeds Study Report by Sahabat Alam Malaysia

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COMMUNITY HEALTH CELL
47/1 St. Mark's Road, Bangalore –

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by Sahabat Alam Malaysia

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Sahabat Alam Malaysia (SAM) is a non-profit, non-governmental organisation campaigning for environmental protection and conservation of natural resources in Malaysia and the Asia-Pacific region.

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PREFACE

This is a report on one aspect of the "Green Revolution" or the process of scientific and technological development in the Third World's agriculture which was begun almost two decades ago. The Green Revolution, as is now well-known, through a package of sophisticated irrigation and drainage facilities, chemical fertilizers and pesticides, high yield varieties of seeds (HYV's) and farm machinery, promised bountiful harvests of food crops and was touted as the answer to food shortages in the Third World.

More than that, governments viewed it as the "short-cut" solution to the problem of rural poverty, avoiding the conflictual path to rural development, implicit in radical calls to reform land, labour and capital. The official enthusiasm for Green Revolution projects was fanned by an alliance between two major groups. One consisted of First World agro-business interests, notably chemical, engineering, construction and pharmaceutical businesses, that knocked on the doors of the Third World's capitals looking for lucrative projects and quick profits. The other consisted of international development institutions headed by the World Bank which also saw in agricultural modernization the quick fix to the Third World's agricultural problems, besides themselves gaining great influence and prestige and waxing fat on the commissions from their organizations of the massive financial transfers required to influence Green Revolution projects.

Twenty years later, despite fairly impressive production increases, the socio-economic impact of the Green Revolution in exacerbating income disparities in the countryside, benefitting disproportionately a small number of capitalist farmers, businessmen and bureaucrats and in failing to break the back of the rural poverty syndrome, is now well-known. Less known is the story of how lop-sided and rushed scientific and technological transfer in the area of seeds has spawned a series of localised and national ecological disasters and crop failure. Even more alarming is the possibility of the international seed industry being monopolised by a few trans-national corporations more concerned about profits and the interests of their share-holders than by the anguished cries of the hungry and unfed in the world. Should that happen then it is likely to be accompanied by crop and seed displacement, threatening the well-being of subsistence farmers as well as the ecological heritage of the Third World.

The report sounds the alarm bell on the situation by analysing the profile of the seed industry and documenting how the local farmers in Malaysia are responding to HYV's and their problems. It also recommends suitable action for government to consider to ensure protection of our seed heritage and to minimise the adverse effects of HYV introduction. We want a genuine Green

Revolution which feeds the hungry, uplifts the incomes and living standards of the farmers and puts Third World countries onto a path of steady and progressive growth and well-being. We want HYV's that have been thoroughly experimented with and are not rushed into our fields with our farmers as the guinea pigs just to satisfy commercial or bureaucratic interests. We want science and technology but only that which is appropriate and does not bring about the economic, social or cultural dependency of our people. We hope this report provokes some hard questions about seeds, plant genetic resources and our model of agricultural development so that the interests of our people, especially the farmers are safe-guarded.

We would like to make a special acknowledgement of the authors of "Seeds of the Earth", "Law of the Seeds", "Development Dialogue: 1983/1-2" "Food First" from which we have extracted sections for inclusion in our book. The appendix on "Modernising Hunger" taken from Food First is a very important discussion on the arguments for and against the Green Revolution.

S.M. Mohd Idris
President
Sahabat Alam Malaysia

CHAPTER ONE

THE SEEDS STORY

The food spectrum of prehistoric man embraced at least 1,500 species of wild plants, while over 500 major vegetables were utilized by ancient civilization. However, in contemporary times, human nutrition is derived from no more than 30 plants, with 3 crops — wheat, rice and maize — accounting for 75 per cent of our cereal consumption and a mere 20 vegetable species encountered in field cultivation. Further, selective breeding of "high yielding varieties" (HYV's) on a large scale has fostered a steady tapering of the genetic base within each species of crop.

It is widely accepted amongst agricultural scientists and planners that the world's crop genetic resources are being endangered by the deluge of high yielding, fertilizer responsive seed varieties, which invariably necessitate repeated application of pesticides — a malignant phenomenon spelling grave implications for agriculture and world food security.

Although most of the world's food is produced in the First World, almost every major cultivated food crop has its heritage in the Third World, extending from Latin America, through Africa, to Asia. A glimpse at the centres of origin of some of the major food crops would bear ample testimony to the aforesaid fact:

Barley	—	Asia Minor and Euthopia
Maize	—	Central America and the Andes
Rice	—	West Africa, India, Burma and S.E. Asia
Wheat	—	Euthopia and Asia Minor
Sugarcane	—	India, Burma, S.E. Asia and China

The crucial contribution of Third World nations to global agriculture is lucidly reflected in that all 30 of the world's major food crops — which constitute 95 per cent of human nutrition — originate from a handful of uniquely endowed biospheres located in the Third World. A combination of varied topography, climate and cultivation methods culminated in almost all major crops originating on less than one quarter of the earth's available land. Evidently, the original wild species of the world's major food crops can be traced to some 12 centres of genetic diversity, the so-called **'Vavilov Centres'** — the Mediterranean, the Near East, Afghanistan, Indo-Burma, Malaysia-Java, China, Guatemala-Mexico, the Peruvian Andes and Euthopia.

Germplasm is the basic material employed in the breeding of new varieties of agricultural crops. The "grain rich" states of Europe, N. America and Australia are actually "gene poor", and depend critically upon regular infusion of the Third World crops germplasm in order to ward off the onslaught of perpetually mutating pests and etiologic agents of diseases. Paradoxically, although most of

'Gene rich' Third World is being exploited by the First World.

the gene centres of the world's major food crops, from where germplasm is derived, is situated in the Third World, as things stand it is the North that has managed to achieve extensive collections of plant genetic material and thus exert control over plant breeding and seed production.

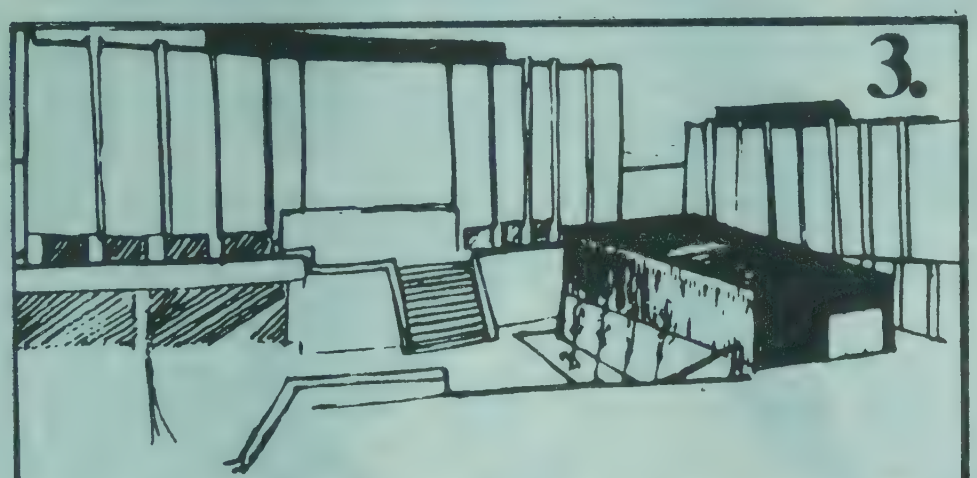
Given this situation, the First World which now possesses approximately three-quarters of the world's stored seeds, might just succeed in hoodwinking the Third World into believing that the relentless northward drain of the Third World's botanical heritage affords mankind the most conducive technological/financial umbrella of feasibility and political security for conservation and perpetuation of its seeds and genetic resources. If that happens, the task of salvaging and preserving rapidly dwindling genetic resources, becomes yet another monopoly of the industrialised nations, then we will see another Third World heritage being manipulated by transnational big business for commercial speculation and exploitation. How could that happen? The next few sections show the first moves have already been made in the crucial area of food crops.

1.

ur major food crops all originated in areas of great genetic iversity called Vavilov centres. This diversity is now threat-ned by uniform seeds being imported from developed ations under Green Revolution type schemes. These seeds ere developed from genes originating in Vavilov centres ollected without payments by expeditions of scientists. he Third World farmers who receive the new seed have to ay for it.

2.

Public plant breeders utilize seed collections to develop new improved varieties for farmers. Most innovative basic research and development is carried out by the publicly funded plant breeding programmes.



3.

There are extensive collections of germ plasm in seed banks around the world. With the loss of much of the genetic resources of the Third World, there has been a limited transfer of these irreplaceable resources to seed banks in developed nations. The seed banks are usually maintained by governments and the seeds within them are in principle accessible to any breeder who wishes to obtain them.

THE SEED STORY

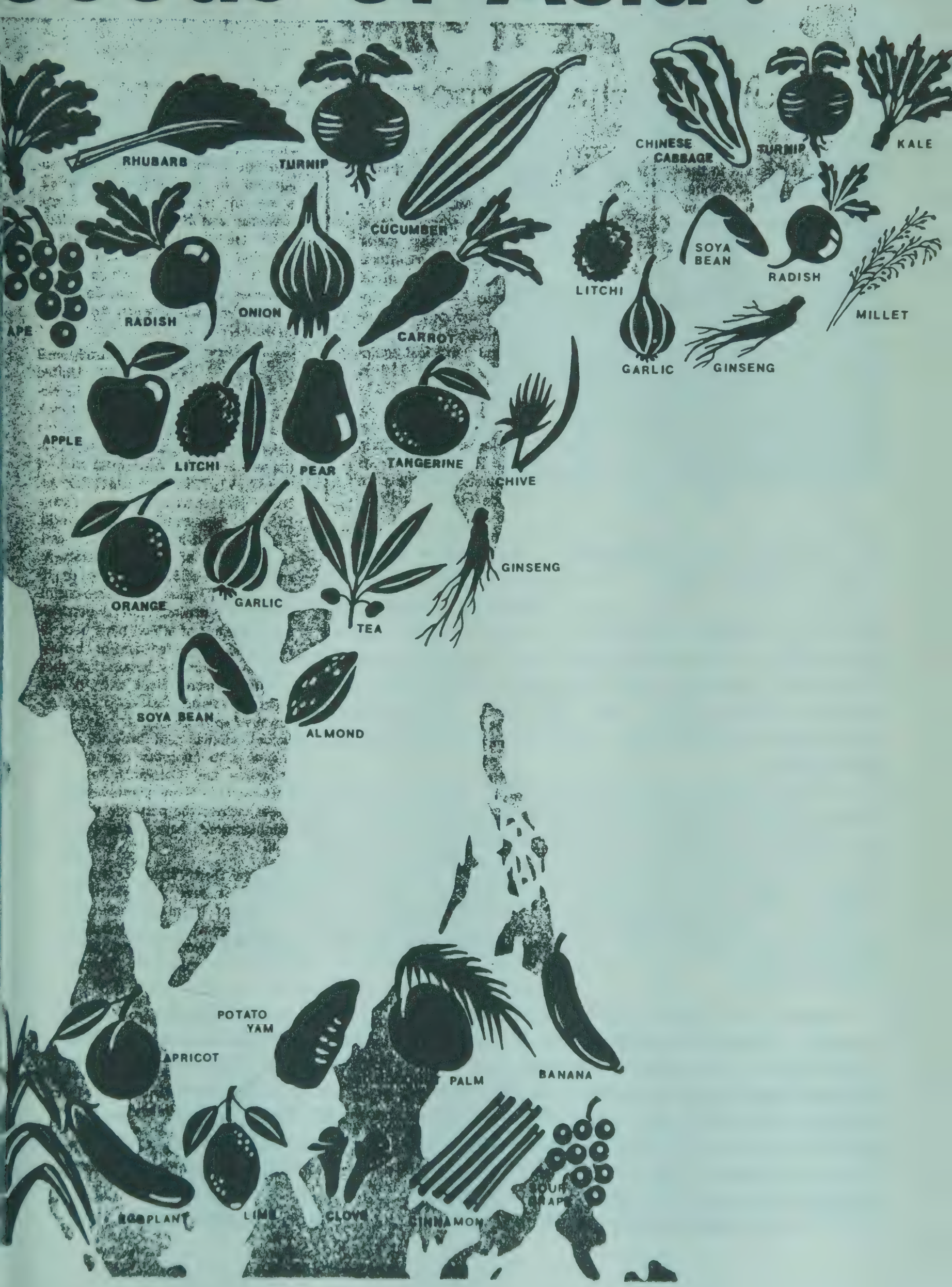
4.

Private corporations usually enter the picture at the very last stage of a plant breeding project. They exploit the fundamental work done at the community's expense by the public plant breeders to produce a marketable product. If PVR laws exist in a country, then the corporation will be the only one to profit from the sale of that variety.

Whither the

CABBAGE
LEEK
PEA
CHINESE CABBAGE
EINKORN WHEAT
SPELT WHEAT
BARLEY
RYE
SWEET CHERRY
FIG
LENTIL
PLUM
GRAPE
POMEGRANATE
LIME
TEA
SUGAR BEET
RICE
WHEAT
MILLET

Seeds of Asia?



CHAPTER TWO

THE GREEN REVOLUTION

The "Green Revolution" has been used to describe the process in Third World agriculture, whereby, technological development, largely inspired by the First World's experiences, has rapidly taken place through the application of modern machinery, chemical fertilizers, and new production methods. Not all the technological development of innovation has been successful; in fact, in a number of important instances, the attempt to introduce new technology as quickly as possible under the pressure of aid agencies, donor governments or commercial interests has resulted in adverse repercussions.

In line with the objectives of the "green revolution", to meet current and future demands of food to feed the growing world population, scientists have, by selective cross-pollination, succeeded in developing "superior" strains of "high yielding varieties" of major food crops characterized by particular combinations of "desirable traits." However, as aptly documented in the 1979 Annual Report of the International Board for Plant Genetic Resources (IBPGR), the indiscriminate spread of new high yielding cereal varieties, during the green revolution, poses an alarming threat to the continued availability of traditional cereal varieties which, over the years, have demonstrated the most effective adaptation to local soil conditions and the greatest resistance to pests and pathogens.

A basic question, to ask is to what extent should plant breeders select for higher yielding, modern varieties that perform best under optimal conditions, in preference to relatively moderate yielding, traditional varieties that perform well under less favourable conditions. Considering the additional inputs (fertilizer, irrigation, pesticides, motor power, etc.) associated with the performance of high yielding varieties, such strains which should be more appropriately termed *"high responsive varieties,"* might be regarded as inferior in a holistic sense.

Indeed, some high yielding varieties have not lived up to expectations. For instance, a farmer's cooperative in the Philippines contends that rice yields achieved on test plots at the renowned IRRI (International Rice Research Institute) bore no correlation to yields recorded in farmers fields — 8 tons per hectare at the IRRI, but only 1.75 tons per hectare in the fields. The farmers also claimed that traditional varieties with more disease-resistant strains were known to equal, if not better, the yield per hectare of high yielding varieties without the need for commercial fertilizers and pesticides. In India, during 1973-74, Bengali farmers lost 80 per cent of their rice crops plus seedlings for

FAO

the next year's crop when they planted, as per instructions, new semi-dwarf rice varieties in the river delta area — high water destroyed the crop where the older, traditional varieties might have survived.

Besides these unhappy experiences with HYV's that have not been made to undergo thorough and judicious testing and experimentation before they were released to the farming community, there exists scientific evidence to indicate that continued indiscriminate breeding of selected high yielding varieties, if not supplemented by conservation would result in long term genetic erosion and pest/disease susceptibility. Indeed, the steady depletion of traditional varieties could leave the world's food supply precariously poised on the brink of breakdown or famine, since the vastly narrowed genetic base renders crops critically uniform and thus conspicously vulnerable to epidemics of pests and diseases. Genetic uniformity of a crop is often an open invitation for an epidemic to devastate the crop. Conversely, over thousands of years, generations of subsistence farmers in the Third World have developed an astonishingly diverse range of plant variability, a diversity which is imperative to continue the battle against constantly evolving pests and pathogens and to protect crops against adverse weather and soil and conditions. It is this variability which should be protected.

The much publicised "success" of the Green Revolution has also to be evaluated from the standpoint of the small, traditional farmer vis a vis the big, modern farmer. The advent of the Green Revolution and high yielding varieties had disproportionately favoured the big farmers who could afford the sophisticated technology and additional inputs involved. In the process, the small farmer has been by-passed, leading to a gradual phasing out of many age-old, ecologically sound cultivation techniques, and traditional varieties of food crops.

Meal on the 3rd world: The genetic origins of some selected crops

Plants are grouped below in a way which we hope will convenience an easy search through menu or dinner plate and not in strict botanical categories. In some cases, anecdotal information on the history and genetic erosion status of the plant is provided along with the plant's origin.

The global salad

Avocado	Central America (especially Mexico)
Broccoli	Southern Italy/Eastern Mediterranean (erosion risk from cauliflower)
Brussel sprouts	Belgium (F1 Hybrid erosion risk)
Cabbage	Near East/Mediterranean (F1 Hybrid risk)
Carrot	Central Asia
Cauliflower	Southern Italy/Mediterranean (Mark Twain said that cauliflower was cabbage with a college education—risk from exports)
Celery	Mediterranean
Chinese cabbage	China/Japan Centre (F1 Hybrid risk)
Cucumber	Central Asia
Garden cress	Horn of Africa (especially Ethiopia)
Leek	Near East (breeding for uniformity in Europe is narrowing genetic base)
Lettuce	European-Siberian region
Onion	Central Asia (erosion in Third World due to commercial imports and in North America to F1 Hybrids narrowing genetic base)
Radish	China/Japan Centre
Tomato	Central America (rare and extensive germplasm held by Campbell Soup Co., not freely exchanged)
Watercress	European-Siberian region
Welsh Onion	China

Other cooking vegetables

Adzuki Bean/Red Bean	China/Japan Centre
Asparagus	Mediterranean
Broad Bean	Mediterranean Centre
Common Bean	Latin America
Lima Bean/Butter Bean	South America
Moth Bean	Hindustani Centre
Mung Bean/Green Gram	Southeast Asia Centre (urgent collection need)
Cowpea/Black-eye Pea	Horn of Africa (especially Ethiopia)
Chinese Kale	China/Japan Centre
Eggplant	Southeast Asia Centre
Globe Artichoke	Western & central Mediterranean
Jerusalem Artichoke	North America
Kale	European-Siberian region
Okra	Ethiopia & eastern Sudan
Pak Choi	China/Japan Centre (F1 Hybrid risk)
Parsnip	Mediterranean
Pea	Near East Centre
Pepper	Andean Centre (losses due to introduction of improved cultivars with narrow base)
Pigeon Pea	Horn of Africa (esp. Ethiopia)
Shallot	Near East
Spinach	Central Asia
Squash	Andean Centre
Rhubarb	Central Asia (Siberia to Tibet)
Turnip	China/Japan Centre (erosion due to potato introduction in 17th century)

Breads & basics

Barley	Near East (2,000 known barley cultivars—new variations in North America facing erosion from urbanization, irrigation and pesticides)
Cassava/Manioc/Tapioca	Northern South America
Lentil	Near East
Maize/Corn	Central America (esp. Mexico/Guatamala)
Finger Millet	Horn of Africa
Foxtail Millet	China/Japan Centre
Pearl Millet	Horn of Africa
Proso Millet	China/Japan Centre
Oat	Eastern Mediterranean
Potato	Andean Centre (Bolivia/Peru)
Rice	Hindustani Centre (India's 30,000 varieties will drop to 50 within 15 years and 10 will occupy 75% of rice land)
African Rice	West Africa
Mountain Rye	Near East Centre
Rye	Near East Centre
Sorghum	Horn of Africa (Texas Hybrids have eroded diversity in southern Africa)
Sweet Potato	Central America (probably Mexico—is now being studied as an industrial alcohol)
Spelt Wheat	Near East Centre
Bread Wheat	Horn of Africa
Dwarf Wheat	Hindustani Centre
Einkorn Wheat	Near East Centre
Cultivated Emmer	Near East Centre
Yam	Horn of Africa (wild species used in pharmaceuticals also)
Potato Yam	Southeast Asia

Beverages & sweeteners

Chicory	European-Siberian region
Cocoa	Amazon basin (germplasm often lost in transport)
Coffee	Ethiopia (all Latin American coffee originated from one tree imported to Amsterdam from Java)
Cola	West Africa (still used in cola pop)
Mate	South America
Sugarbeet	Mediterranean/Near East (erosion due to commercial import of 'Detroit Globe' varieties to Turkey by such firms as KWS)
Sugarcane	Southeast Asian Centre (erosion increased by maintenance, financial problems and transfers between banks)
Tea	Mountains of southern central China and northeastern India (taken from China by the British East India Company in mid-1800's)

Condiments

Basil	Southeast Asia Centre
Black Pepper	Malabar region of India
Cardamon	Hindustani Centre
Carob	Mediterranean Centre
Cayenne/Bell Pepper	South America
Chive	China/Japan Centre
Cinnamon & Cassia	Southeast Asia
Clove	Southeast Asia (Dutch East India Co. attempted to monopolize cloves on the Moluccas by destroying other trees)
Dill	Mediterranean Centre
Fennel	Mediterranean Centre
Garlic	Central Asia Centre
Chinese Carlic	China/Japan Centre
Ginseng	China/Japan Centre
Licorice	European-Siberian region
Marjoram	North Africa
Mint (pepper, spear)	Mediterranean Centre
Mustard	Horn of Africa (Ethiopia)
Nutmeg	Southeast Asia Centre
Tobasco Pepper	Central America
Vanilla	Central America

From the fruit bowl

Apple	Central Asian Centre
Apricot	Southeast Asia and China
Banana	Southeast Asia Centre
Blueberry	North America
Sweet Cherry	Near East Centre
Cranberry	North America
Date Palm	Horn of Africa
Desert Date	Mediterranean Centre
Fig	Near East Centre
Gooseberry	European-Siberian region
American Wild Gooseberry	North America
Grape	Near East
Common Grape	Central Asia/Mediterranean
Muscadine Grape	North America
Grapefruit	Caribbean
Lemon	Southeast Asia
Lime	Northeast India
Litchi	China/Japan Centre
Mango	Northeastern India
Muskmelon/Canteloupe	Horn of Africa
Sour Orange	Southeast Asia
Sweet Orange	Southern China
Papaya/PawPaw	Central America
Passion Fruit	South America
Peach	China/Japan Centre
Pear	China/Europa-Siberian region
Pineapple	South America ('Cayenne' or 'Kew' or 'Sarawak' variety is rapidly replacing others)
Plum	Near East Centre
Chinese Plum	China/Japan Centre
Pomegranate	Near East Centre
Pomelo	Southeast Asia
Pumpkin	Latin America
American Red Raspberry	North America
Black Raspberry	North America
Tangerine	Southeast Asia Centre
Mandarin Tangerine	Philippines or China
Virginian Strawberry	North America
Watermelon	Horn of Africa

Nuts

Almond	Central Asia;
Indian Almond	Southeast Asia;
Cashew	South America;
Chinese Chestnut	China/Japan Centre;
Spanish Chestnut	Near East Centre;
Coconut Palm	Southeast Asia;
Groundnut/Peanut	South America;
Hazel Nut	Near East Centre;
Pecan	Central America
Oriental Sesame	Horn of Africa
Black Walnut	North America
Water Chestnut	China/Japan Centre

Oils

Rape/Canola	Mediterranean Centre
Soya Bean/Soybean	China/Japan Centre
Sunflower	North America
Tung Oil Tree	Asia

That home-grown meat

The animals themselves

Cattle	Eurasia/North Africa
Chicken	India
Goat	Near East
Pig	Near East
Sheep	Near East
Turkey	North America

Our meat animals eat heavily from such cropss as maize, potatoes, barley, oats, soybeans, cassava and sorghum as well as the following fodder crops. Genetic erosion in fodder has been ascribed to such factors as improved pastures, irrigation and use of herbicides. In many cases, what was once a pasture grass has become a lawn grass. These, too, are included below.

All flesh is grass. Isaiah 40:6

The food they eat

Fodder Beet	Europe-Siberia region
Bermuda Grass	Hindustani Centre
Crimson Clover	Mediterranean Centre
Red Clover	European-Siberian region
Subterranean Clover	Mediterranean region
White Clover	European-Siberian region
White Sweet Clover	European-Siberian region
Fescue	European-Siberian region
Dallis Grass	South American Centre
Tufted Hairgrass	North America
Kentucky Bluegrass	European-Siberian region
Common Lespedeza	China/Japan Centre
Korean Lespedeza	China/Japan Centre
Perennial Lespedeza	China/Japan Centre
Blue Lucerne/Alfalfa	Central Asia
Yellow Lucerne/Alfalfa	European-Siberian region
Orchard Grass	European-Siberian region
Pampas Grass	South America
Veldtgrass	Horn of Africa
Common Vetch	Near East
Wheatgrass	North America

Industrial and medicinal plants

Camphor Tree	China/Japan Centre (industrial and fabric protection)
Castor Bean	Horn of Africa (medicinal)
Cinchona (Quinine)	Andes Centre (malarial drug—stolen by British for Asian estates)
Egyptian Cotton	Horn of Africa (cloth)
Short Staple Cotton	Horn of Africa (cloth)
Tree Cotton	Hindustani Centre and Horn of Africa
Upland Cotton	South America
Flax/Linseed	Central Asia (cloth, cigarette wrappers)
Luffa (Loofah) Gourd	Central America (rubber plant)
Guayule	Central America (rubber plant)
Hemp/Sisal	Central America (baler twine—surreptitiously removed from the Yucatan by German entrepeneurs)
Hemp (Cannabis)	Hindustani Centre (drug)
Manilla Hemp	Southeast Asia (rope)
Lavender	Mediterranean Centre (scent)
Opium Poppy	Mediterranean/Central Asian centres
Quinine	Andean Centre (drug)
Rubber	Amazon basin (surreptitiously removed from Brazil by British for Asian estates, only 22 seedlings reached Singapore and breeding has narrowed base further)
Tobacco	South America

Flowers on the table

Acidanthera	Southern Africa
Begonia	Central America/Andes Region
Camellias	China/Japan Centre
Chrysanthemum	China
Gladiolus	Europe (possibly Belgium)
Paeonia	Probably China
Rhododendron	China/Japan Centre
Rose	A cross of Chinese and Persian strains
Tulip	Near East (possibly Turkey)
Zinnia	Central America (probably Mexico)

(Source: Pat Roy Mooney: 'The Law of the Seed' in **Development Dialogue,** 1983: 1-2, pp. 20-22)

CHAPTER THREE

TRANSNATIONAL CORPORATIONS

Due to its profitability, the global seed trade an offshoot of the Green Revolution and high yielding varieties has become one of the fastest expanding and most lucrative industries in the food and agriculture sector. Implementation of plant breeders ''rights'' and ''patents'' protection initiated corporate interest in the seed trade, as it permitted plant breeders to collect royalty payments on newly developed varieties and to control the sale and distribution of such seeds. Very rapidly, a host of transnational pharmaceutical, chemical and petroleum companies infiltrated, and have subsequently monopolised the seeds business.

Corporate interest in plant, breeding and commercial seed production stems from the fact that unlike open-pollinated traditional varieties, hybrid high yielding varieties can be multiplied only by the owner of the parental lines. In this context, establishment of the ''International Union for the Protection of New Varieties'' (UPOV) in 1961 with France, Federal Republic of Germany, the Netherlands, Belgium and Italy as founder members, ensured guarantee of unequivocal control, via a plant patenting system, over the marketed genetic resource commodity.

The far reaching implications of monopolised plant breeding has since prompted the United Kingdom (U.K.), Ireland, Denmark, Sweden, Switzerland, Spain, Israel and South Africa to join the UPOV founders, while the United States of America (U.S.A.), Canada, Australia, Mexico, New Zealand, Japan, Norway, and Kenya have expressed a desire to enlist in the UPOV. Meanwhile, Japan and the U.S.A. have devised their own plant patenting systems.

Notwithstanding the promise of soaring profits, plant breeding is an expensive enterprise and, hence, beyond the reach of small companies. Estimates on the costs involved can reach US $2.5 million for the development of a single new variety of one of the world's major food crops. Under the circumstances, small companies can ill afford to commit mistakes, take risks, absorb initial failures and financial set-backs or secure the necessary exorbitant investment capital.

As a sequel, in an extremely competitive market, big companies have been 'gobbling up' smaller companies in a process of ''buying and being bought'' leading to the fate of the world's botanical genetic heritage being dictated by an elite group of transnational conglomerates (TNC's). Unless radical steps are taken, Third World farmers will, in the not-too-distant future, be offered ''technology packages'' by transnational corporations engaged in the seeds trade (who simultaneously are involved in the marketing of fertilizers, pesticides

and farm equipment) that they simply cannot refuse.

The principal petrochemical and pharmaceutical transnational corporations which monopolise the global seeds trade include: Royal Dutch/Shell (U.K. and the Netherlands), Tate and Lyle (U.K.), Rank and Novis McDougall (U.K.), Sandoz (Switzerland), Ciba-Geigy (Switzerland), Rhone-Poulenc (France), Elf Acquataine (France), EMC Group (France), Kemanobel (Norway), Bayer (Germany), BASF (Germany), and the U.S. Companies Pfizer, Upjohn, Grace, Rohm and Hass, Agresearch Inc., Dekalb, Pioneer, Union Carbide, Monsanto, Purex, Olin, Occidental, ITT, FMC, Cargill and Anderson-Clayton.

The alarming extent of control exerted by transnational corporations on the world's major food crops is discernible from the following table which depicts the percentage of germplasm controlled, via seed patents, by the private sector in the U.S.A.

No. of Corporations	Percentage of seed patents	Crops
4	48%	Soybeans
4	36%	Wheat
1	100%	Eggplant
2	100%	Sweetpeas
3	100%	Tobacco
2	100%	Cauliflower

Look where the Seeds are going

A Profile of the Corporate Seed Giants

As a result of seed legislation in Europe in the sixties and in the U.S. in 1970, many small and independent seed companies have been absorbed by giant transnational corporations. The primary corporate interests of these TNCs are petrochemicals and pharmaceuticals, but there are others whose product lines are not related. ITT, for example, has major interests in telecommunications technology but it has also become involved with seeds.

The following are profiles of some of the new seed owners derived from Pat Roy Mooney's revealing and enlightening book, *Seeds of the Earth*, together with additional notes.

CARGILL, a U.S. corporation, is the world's largest grains commodity trader. Since CARGILL is not considered an industrial firm, it is not included in the *Fortune* 500 but it may have ranked 12th top American company in the 1976 *Fortune* list. It was the number one private non-industrial U.S. corporation with sales of US$28 billion in 1981. (*Fortune*, May 31, 1982) CARGILL is very active in hybrid wheat breeding; it acquired Dorman Seeds (USA) and Kroecker Seeds (Canada). It has also been implicated in some legal actions as a result of its grain buying and exporting activities in North America, Panama and Europe.

Ciba-Geigy Ltd., a Swiss firm, ranks number 52 among the 500 biggest corporations outside the U.S. (*Fortune*, Aug. 23, 1982) with sales record of US$7,061,961,000. Its products lines include dyestuffs and chemicals, pharmaceuticals, agrochemicals, plastics and additives. It has more than 74,000 employees scattered over manufacturing facilities in 52 countries. A few years ago, it bought two seed companies — Funk Seeds International and Steward Seeds (Canada), and has expanded into plant breeding programs in North and South America. No less than 28 percent of its sales are in the Third World. CIBA-Geigy's biocides, for example, are popular in India and the Philippines.

FMC is a U.S.-based corporation with five major, product lines: food and agricultural machinery and chemicals; material and natural resources handling equipment; construction and power transmission products; industrial chemicals; and government and municipal equipment. FMC ranked number 109 in *Fortune* 500 with total sales of US$3,581,960,000 in 1981. A few years ago, FMC bought Seed Research Association in the U.S. FMC is well-known in many parts of the Third World for its agrochemical products like the corn and rice insecticide *Furadan* and the cotton insecticide *Pounce*. Other biocides produced by FMC are *Ethion*, *Thiodan* and *Polyram*. FMC uses Philippine

seaweeds as a natural food additive in processed foods.

International Telephone & Telegraph (ITT) ranked 14th in *Fortune* 500 with total sales of US$17,306,189,000 in 1981. It employs around 375,000 workers in many parts of the world. Aside from the telecommunications equipment, ITT is also in publishing, forestry, insurance, bakeries, several engineering as well as consumer products. More than half of its sales are generated from outside the U.S. ITT acquired a dominant grasses firm in the U.S. — O.M. Scott and Sons, and Burpee Seeds, the largest garden seed retailer in the U.S. a few years ago.

Monsanto had total sales amounting to US$6,947,700,000 in 1981, giving it the 50th rank in the *Fortune* list of top U.S. corporations. The product lines of this firm are agricultural products, chemical intermediates, commercial products, industrial chemicals, plastics, resins and textiles. The largest contributor to its profit is the agricultural products division. More than a third of its sales come from outside the U.S. where it has about 100 manufacturing plants in 21 countries. A pesticide formulation plant was inaugurated in the Philippines in 1982. Some of its products are *Lasso*, *Roundup* and *Machete*, all herbicides. These are all sold in many parts of Asia and the rest of the world. MONSANTO has 76 sales offices in 42 countries. Farmer's Hybrid Company, a seed firm, was recently bought by MONSANTO.

Royal Dutch/Shell (RD/S) of United Kingdom and the Netherlands is *Fortune's* number 1 corporation outside the U.S. (and number 2 in the whole world) with total sales of US$82,291,728,000 in 1981. ROYAL DUTCH/SHELL employs some 155,000 people all over the world. RD/S claims it has the largest chemical interests of any oil company, and around US$300 million of its sales in 1977 came from agro-chemicals. RD/S markets several pesticide brands, many of which have been investigated, restricted and/or banned in many countries because of their harmful effects. Shell and its subsidiary, Velsico, marketed the notorious *Leptophos* and *Dieldrin* insecticides. Human and livestock deaths traceable to *Leptohos* use in Egypt, Indonesia and Colombia have been documented. Many plant workers in Texas, where the pesticide was being manufactured, have become seriously ill.

Royal Dutch/Shell's extent of seed interest is hard to determine, but because of its many recent acquisitions and joint ventures, it is said to be the current world's largest seed company. Nickerson Seeds Company of the U.S. is now under Shell control, making the latter very influencial in the European seed industry. Shell controls large seed firms like Bush Johnson, International Plant Breeders (IPB) and Rothwell Plant breeding, all in the U.K. Zwann and Zwaanesse, and Broersen of Holland are also under Shell control and so are several other seed companies in France, Germany, Sweden and Denmark. Shell dominates more than 20 European seed firms.

Upjohn is a U.S. firm known chiefly as a drug corporation but it is also in medical services, seeds and agricultural services. It ranked 205th in the *Fortune* 500 list with total sales of US$1,898,334,000 in 1981. More than a third of its sales in 1977 came from 150 countries, excluding the U.S. It has manufacturing facilities in 17 countries, excluding the U.S. and Puerto Rico, with plants in Argentina, Venezuela, Mexico, Korea and Indonesia. Upjohn recently puchased Asgrow Seeds and Associated Seeds. Asgrow is a major vegetable seed company in the U.S., developing and marketing peas, beans and sweet corn, as well as agronomic seeds (for planting only) like hybrid corn and hybrid sorghum. Upjohn and Asgrow are also involved in pesticides and herbicides manufacturing.

San Miguel Corporation, a Philippine-based transnational corporation is now competing as supplier for the hybrid corn to the Philippine government's Maisagana (Bountiful Corn) Program. SMC ranked 6th in *Business Day's* list of top 1000 corporation in the Philippines with total sales of P5,5323,456,000 in 1981 (approximately US$665,432,000). It is best known for its beer which is marketed worldwide, with some breweries located outside the Philippines. SMC has invested heavily in food products and agribusiness.

Planters Products, Inc. is the Philippines leading agrochemical company and ranked number 22 in the top 1000 corporations list in 1981 with total sales and revenues amounting to P1,143,242,000 (approximately US$142,905,250). Planters Products is a public corporation owned by Filipinos and heavily supported by the government through a fertilizer subsidy scheme. A hybrid corn processing plant was inaugurated in February 1983, owned by Pacific Seeds (Phil.) Inc., a subsidiary of Pacific Seeds (Australia) Inc. Planters Products is the exclusive distributor of Hycorn 9, a major component of the national corn program, and a product of Pacific Seeds. Minister of Agriculture Arturo Tanco stated: "It is heartening to know that Pacific Seeds (Phil.) Inc. is inaugurating a hybrid seed processing plant.... At a time when the country is in the midst of a determined effort to achieve self-sufficiency in agricultural crops, particularly in yellow corn, the opening of this seed processing plant is, indeed, auspicious and timely." Tanco is Chairman of the Board of Directors of Planters Products Inc.

CHAPTER FOUR

PERFORMANCE OF HYV's IN ASIAN COUNTRIES

Trends in the production of food and cash crops over the past decade or so in several Asian countries show a grave threat to the future of agriculture. One of the principal factors contributing to this unhealthy trend is genetic erosion arising from the widespread adoption of high-yielding, fertilizer-responsive, pesticide-dependent varieties of commercially esteemed crops.

To compound the problem, a handful of petro-chemical and phamaceutical transglobal conglomerates have gained monopoly over the breeding, production and marketing of "patented" seeds, besides their control of the fertilizer and pesticide markets.

Rice, the staple food of most Asians, is an ideal food crop to highlight the adverse effects and unsuitability of the fast model of HYV development in the rice growing regions of Asia. In the section below, various country experiences with HYV's that have been unsuccessful or have had adverse results are highlighted.

(a) The Philippines

The Philippines was the first nucleus of the Green Revolution movement in Asia, partly because it housed the renowned International Rice Research Institute which was responsible for churning out HYV's of rice. Consequently, by 1979, over 72 per cent of the area under rice cultivation was planted with HYV's, with modern rice varieties accounting for 82 per cent of the total Philippine paddy crop.

Although HYV's of rice had, in 1979, increased the average yield per hectare by 42 per cent the majority of farms where there was no provision for irrigation witnessed a 10 per cent decline in yields from the old average of 2,000 kg of rice per hectare. Notably, during the same period the yield of traditional varieties of rice had increased by 6 per cent on irrigated farms (ironically, their potential exploitation was not encouraged or highlighted by the agricultural authorities concerned).

Widespread propogation of HYV's has without suitable conservation of traditional strains eradicated several traditional varieties of rice, while predominance of selected HYV's paved the way for genetic erosion. The ensuing greater susceptibility to pests and pathogens had a telling effect on the socio-economic status of thousands of small farmers and has necessitated a reappraisal of the long-term viability of HYV's and modern agricultural practices. For instance, during 1973-74, the entire Philippine rice crop was virtually

devastated by the *Tungro virus* which ravaged the extensively adopted IR-20 and allied modern HYV's of rice. Further more, most farmers contend that steadily escalating costs of fertilizers, weedicides, insecticides and other additional inputs tend to offset whatever "profits" that can be attributed to the increased yield of HYV's.

Notwithstanding the fact that most traditional varieties of rice had disappeared in the wake of the HYV's, farmers have of late, where possible, reverted to planting of traditional varieties which are better suited to local conditions and which require less attention and capital/energy-intensive inputs.

(b) Bangladesh

Rice occupies 80 per cent of the cultivated land in Bangladesh. However, when compared to other rice growing countries like the Philippines and India, the adoption of HYV's in Bangladesh is not as widespread, with only a little projected increase in the foreseeable future. The acreage of HYV's out of the total acreage under rice cultivation in Bangladesh was 2.6 per cent out of 25,487 acres during 1969-70, 15 per cent out of 24,097 acres during 1974-75 and 14 per cent out of 24,992 acres during 1978-79.

Over a period of nine years, the Bangladesh Rice Research Institute (BRRI) has developed and introduced 15 modern HYV's (along with 26 improved local varieties) of rice. Since the modern HYV's proved unsuitable for cultivation under conditions typical of Bangladesh (fluctuating water level, flooded fields, etc.), the BRRI and BARI (Bangladesh Agricultural Research Institute) have come

under severe criticism for bull-headedly pursuing research on imported HYV's from the IRRI in the Philippines, instead of concentrating their efforts on improving locally available traditional varieties.

Some BRRI scientists report that HYV yields for paddy average are 60-70 mounds per acre (1 mound = 36 kg), as opposed to 20-35 mounds per acre for traditional varieties. However, other reports have indicated that HYV's perform miserably in the field with yields seldom exceeding 26 mounds per acre. Interestingly, at a Bangladesh Agricultural Development Corporation (BADC) multiplication farm, even under the most optimal conditions, actual yields only approximated 50 per cent of yields predicted by the BRRI.

Even with not-so-widespread adoption of HYV's in Bangladesh, in 1979, the BADC spent 51 per cent of its budget on fertilizers, 41 per cent on irrigation, 4 per cent on seeds and 2 per cent on pesticides. Clearly the existing model of HYV development is development is dependent on large capital inputs.

This in turn has skewed the current agricultural policy of the Bangladesh government towards foreign financial laid. The net projected investment for the medium term food production programme under the prevailing 5-year plan is $3.4 billion, with an estimated external assistance requirement of $3.2 billion.

(c) India

Plagued by recurring famines, in 1965 India opted for the green revolution system of agriculture, thus heralding the widespread usage of HYV's which could perform well only under conditions necessitating heavy application of fertilizers, pesticides and other modern inputs.

By 1968, the Taiwanese variety Taichung Native 1, which was extensively introduced during 1966-67, occupied 42 per cent of the total area under HYV's. Being rather prone to pests and pathogens, it did not impress the farmers who tended to reject it. Subsequently, the area under Taichung Native 1 cultivation dwindled to less than 9 per cent by 1969-70. Several other hybrid HYV's, bred both in India and abroad, met with the same fate. Virtually all the modern HYV's introduced into India were characterized by dwarfism, a trait dictated by a gene originating from a single source, Dee-Geo-Woo-Gen; the narrow genetic based HYV's simply could not cope with the complex cultural conditions in India.

The farmers have pointed out that instead of introducing exotic HYV's into conditions which alternate between flooding and drought, and into areas where inadequate drainage caused water related problems, the adoption of better crop management techniques and utilizing traditional local varieties would furnish higher yields under less favourable conditions than that the yields of HYV's; besides affording greater resistance to pests, pathogens and adverse climatic conditions.

In the Indian State of Madhya Pradesh, despite the adoption of HYV's, application of chemical fertilizers and pesticides and development of effective extension services, rice yields have remained rather low. Among the factors responsible for the observed trend were inequalities of land ownership, an exploitative system of land tenure and lack of incentives for workers. While the

majority of small farmers simply could not afford the capital-intensive additional inputs associated with HYV's, others rejected modern HYV's on account of their greater susceptibility to pests, pathogens and adverse climatic conditions.

Another serious shortcoming of the cultivation of HYV's, is the costly technology involved, and the need for subsidies. For instance, during 1979-80, the Indian government spent Rs 145 crores on subsidies for the import of fertilizers, another Rs 448 crores in subsidies to persuade farmers to purchase fertilizers and Rs 560 crores in subsidies to enable consumers to purchase food produced at higher costs. In fact, in 1981, food and fertilizer subsidies accounted for 64 per cent of all government expenditure on subsidies. Unfortunately, the returns on such massive investment have been pitifully poor, and millions of Indians continue to suffer from malnutrition.

Young people at work in a Sri Lankan paddy field;

Critisizing the indiscriminate adoption of HYV's in India, Dr. R.H. Richaria, former director of the prestigious Central Rice Research Institute in Cuttack, contends that *"any technology which is unrealistic in its approach towards field problems in relation to the environment and ignores the agro-socio-economic conditions of the farmers, is bound to crash. An imported technology of whatever high standard cannot be applied in toto in a variable and fluctuating environment."* Alternatively, Dr. Richaria advocates the "minimum input-maximum production" strategy which revolves around the use of the indigenous genetic diversity of traditional varieties of rice, along with the adoption of intermediate technology, better suited to local climatic conditions and agronomic practices.

CHAPTER FIVE

AGRICULTURE IN MALAYSIA

The significance of agriculture, including fisheries, in the Malaysian economy is shown by the fact that 55 per cent of the nation's working population is engaged in the agricultural sector. Further, agriculture plays a dominant role in national development as it accounts for 30 per cent of the GNP and contributes to 60 per cent of the country's foreign exchange earnings.

Malaysia is the world's largest producer and exporter of oil palm, rubber and timber. A string of "secondary" crops-cocoa, sugarcane, pineapples and coconut — have attained considerable prominence as equally important earners of foreign exchange.

Although agriculture continues to constitute one of the principal pillars of Malaysian economy, according to the Third Malaysia Plan (TMP), 68.3 per cent of all agricultural households in 1970 eked out a living below the poverty line, barely making ends meet. The incidence of poverty in the agricultural sector surpassed that encountered in all other sectors of economy, with the highest poverty rates recorded among the agricultural workers (92%) and padi farmers (88%) in 1970. Since then, the situation has improved and, in 1980 the incidence of poverty among agricultural households had dropped to 46.1 per cent, with a corresponding recovery in poverty rates among agricultural workers (64.1%) and padi farmers (55.1%).

In line with the overall objectives of the government to eradicate poverty and to attain self-sufficiency in food production, numerous research projects were launched at centers like MARDI, RRI, PORIM, and Universiti Pertanian. Simultaneously, various development and expansion schemes were initiated — particularly on rice cultivation — with emphasis on increased production via construction of more drainage and irrigation facilities (a prerequisite for double-cropping) and the adoption of fertilizer-responsive, pesticide-dependent scientifically "improved" high-yielding varieties of padi. During the tenure of the TMP, Malaysia was 84 per cent self-sufficient in rice, the staple food of the local population, and it was estimated that, with a population growth rate of 2.6 per cent per annum, the country would be confronted with an annual deficit of 560,000 tons by 1980 unless production measures were stepped-up.

However, over the past three decades, food production techniques in Malaysia have become increasingly capital-intensive and energy-intensive. Current practices of rice cultivation, for instance, involves modern high yielding varieties which are designed to perform well only under optimum conditions — a situation that warrants additional inputs in the form of petroleum-based chemical fertilizers and pesticides, irrigation and mechanisation.

Kementerian Penerangan Malaysia

Unfortunately, this trend has only served to widen the gap between the "haves" and the "have-nots"; the small farmers who could not afford the additional inputs were adversely affected, and many have been forced to abandon farming and to seek alternate sources of livelihood. Under the circumstances, it would be advisable to reconsider the present concentration of financial and other resources on expensive, heavily subsidised, capital-intensive projects for a few irrigation schemes for padi, and land development schemes for cash crops like rubber and oil palm in favour of programmes geared to enhance the productivity of the vast majority of the poor peasants in the rural, traditional sector.

850

COMMUNITY HEALTH CELL
47/1, (First Floor, St. Marks Road
Bangalore - 560 001

Padi Farming in Malaysia

Seedlings in the nursery.

A modern ploughing machine.

Farmers clearing their fields.

Transplanting seedlings.

Growing paddy plants in the fields.

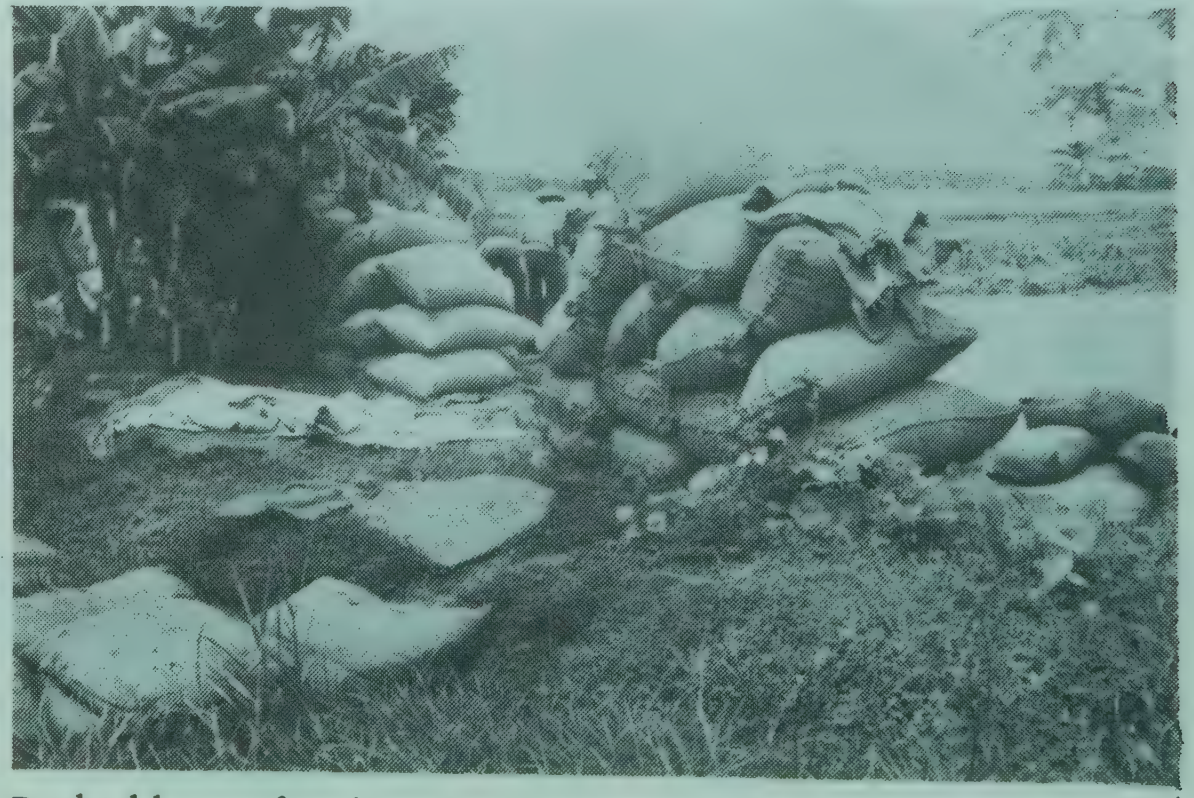
Harvesting by the 'berderau' system.

Threshing the harvested paddy.

Bullock power transporting padi.

Collection centres by the bunds.

Winnowing the threshed padi.



Packed bags of padi ready for transport to the rice mills.

CHAPTER SIX

HYV's OF RICE IN MALAYSIA

The proliferation of modern HYV's of rice in Malaysian agriculture is a direct off-shoot of the Green Revolution. However, systematic breeding of rice varieties in Malaysia was begun much earlier — probably around the turn of the 20th century.

The first variety of rice to be developed and released by the pureline selection method was the Seraup Kechil 36 in 1915. Subsequently, several research stations developed and released a number of other varieties of rice, including Mayang Ebos 80, Radin China 4, Nachin 11, Siam 29, Subang Intan 16 and Seraup Kechil 48.

Since the pure-line selection method afforded no genetic advantage to crop populations wherein genetic variability had been depleted, hybridization breeding programmes were resorted to for generating improved HYV's of rice. Nevertheless, from available information it seems that early hybridization techniques, attempted from 1927, met with little initial success.

With the introduction of the double cropping system in 1950, greater emphasis was placed on the development of fast-growing HYV's of rice. However, further expansion of the double cropping system of rice cultivation was rather slow until 1964, principally due to non-availability of acceptable HYV's suited for double cropping. Under the double cropping system, between 1964 and 1974, the following 11 different varieties of rice were developed and released locally by MARDI and the Department of Agriculture:

(a) Malinja (1964)
(b) Mahsuri (1965)
(c) Ria (1966)
(d) Bahagia (1968)
(e) Murni (1972)
(f) Masria (1972)
(g) Jaya (1973)
(h) Sri Malaysia I and II (1974)
(i) Pulut Malaysia I and II (1974)

Since then, MARDI has developed and released Sekenchang (1979), Sekembang (1979), Setanjung (1979), Kada Ria (1981) and Pulut Siding (1981).

The success of many HYV's of rice in Malaysia has been rather discouraging, and many of the HYV's that were introduced had to be subsequently abandoned due to poor performance and apprehension on the part of the farmers. One of the over-riding factors against HYV's is the inconsistent performance and

The burden is on the farmer.

yield over sustained periods of time, with a drastic decline in crop harvest, with or without exceptionally high susceptibility to pests and pathogens, after three to five years. Some farmers have reportedly switched HYV's five times within a short span of ten years.

The unsuitability of many modern HYV's introduced into Malaysian agriculture can be listed. In early 1964, the first HYV, "Malinja" was released; although Malinja was characterized by a short maturation period of 130-140 days and an improved grain quality, the variety was not widely adopted due to its high susceptibility to blast (a plant disease) and pests. A cross named "Mahsuri", which was introduced in 1965, also proved highly susceptible to blast. In 1966, a line from IRRI, IR 8-288-3, locally termed "Ria" was released. Notwithstanding the high yield potential of 5.6 tons per hectare, Ria was not readily accepted by farmers in view of adverse factors such as short stature, poor rice quality and the substantial additional inputs required for optimum performance. Over the next few years, at least another five HYV's were introduced, but these too did not find favour among rice cultivators for various reasons — "Bahagia" and "Jaya" did not enjoy sustained popularity, while "Murai", "Sri Malaysia I" and "Sri Malaysia II" did not attain any measure of popularity at all.

Among the so-called shortcomings of traditional varieties of rice are the relatively lower yield and the longer maturation period which enables only a single crop per year. However, the relatively lower yield of traditional varieties is partially offset by the heavier weight of rice grains, while the longer padi

stalks permit better survival during floods. Further, traditional varieties of rice are more adaptable to a wider range of conditions, better suited to local conditions, perform relatively well even under adverse conditions, are less susceptible to pests and pathogens, require less additional chemical inputs and irrigation facilities, characterized by a more desirable texture and flavour and are less prone to breakage during the process of milling.

Neill Mckee/IDRC

Under the circumstances, it is obvious that farmers who prefer to cultivate HYV's do so strictly for economic reasons — the relatively "higher" yield and shorter maturation period (which enables double cropping) account for increased production and income (notwithstanding the fact that the HYV's planting scheme is heavily subsidised).

Among the host of maladies attributed by many scientists to the Green Revolution is the unprecedented onslaught of pests and pathogens linked with HYV's and modern agricultural practices. For instance, researchers at the IRRI in the Philippines have demonstrated that four major ecosystem changes, all stemming from modern technological innovations in agricultural production, especially the widespread introduction of HYV's and associated additional inputs, have contributed to large scale outbreaks of BPH (brown plant hopper):

(a) Extensive planting of modern HYV's of rice: The modern varieties are bred short to facilitate mechanisation; but the uniformity promotes the habitat for BPH attack, as the new varieties are uniformly more susceptible when compared to previously cultivated resistant local traditional varieties of rice.

(b) Increased use of nitrogen-containing fertilizers: Besides increasing the growth rate and nutritive value of the rice crop, nitrogenous fertilizers also accelerate the growth and reproduction of BPH.

(c) Increased use of insecticides: Increased pesticide application, particularly in developing nations where there are insufficient guidelines, legislation and controls, has the disastrous effect of destroying natural enemies that would otherwise regulate populations of BPH. The insecticides also destroy the food sources of the natural enemies, causing death by starvation, and render fields vulnerable to the hardy BPH which gradually develop resistance to the commonly sprayed pesticides. Ironically, at sub-lethal levels, some insecticides even stimulate the feeding and reproduction rate of BPH.

(d) Rapid expansion of irrigation systems: Irrigation facilities promote the breeding and proliferation of BPH by creating a more moist micro-environment. The prime aim of irrigation systems is to permit double or triple cropping, and the BPH, which thrives solely on padi, thus have a steady source of food supply throughout the year (previously vast populations of BPH would die-out during the dry season when no padi was planted).

According to farmers the outbreaks of padi pest infestation in epidemic proportions is a fairly new phenomenon in Malaysia. Over the past four to five years, the devastation by padi pests and pathogens of modern high-yielding, fast-growing (conducive for double cropping) varieties of rice has greatly increased.

Most serious has been the upsurge in the incidence of the red virus disease or "penyakit merah viral" (PMV), a dreaded viral disease transmitted by the green hopper. Apparently, there is no known cure for the PMV, and the only "solution" involves burning of affected fields to prevent the disease from spreading to healthy, neighbouring plots of padi.

Both the total acreage of padi ravaged by the PMV, and the resulting economic losses have escalated alarmingly since 1978:- four hectares ($5,300) in 1978, 202 hectares ($266,400) in 1979, 367 hectares ($484,000) in 1980, 13,000 hectares ($17.2 million) in 1981 and 17,600 hectares ($23.2 million) in 1982.

HYV: THE INSIDE STORY

WHAT MIRACLE HARVEST! WITH OUR FALLING ECONOMY AND HUNGER ALL AROUND US, IT'S NICE TO KNOW THAT HYV HAS BROUGHT US SUCH ABUNDANCE! IT'S GOOD TO HAVE REPLACED THE TRADITIONAL VARIETY; WITH HYV, PROGRESS MAY NOT BE LONG ON THE WAY.

OH, OH... I WON'T BE TOO SURE OF THAT.

HEY! WHO...?

I'M THE TRADITIONAL (RICE) VARIETY. YOU SEE, AFTER KEEN OBSERVATION AND ANALYSIS, I THINK WITH HYV, PROGRESS WILL TAKE MUCH LONGER OR MIGHT NOT EVEN TAKE PLACE AT ALL!

FOR INSTANCE, BECAUSE HYV IS CHEMICAL DEPENDENT, YOU HAVE TO NOURISH IT WITH FERTILIZERS AND PESTICIDES DURING PLANTING TIME.

LATER, YOU HAVE TO DEDUCT FROM YOUR "MIRACLE HARVEST" ALL PAYMENTS FOR THESE CHEMICALS AND SEED VARIETIES NOT TO MENTION PAYMENTS TO ALL YOUR OTHER CREDITORS FOR LAND RENT, ANIMAL RENT, ETC. PRACTICALLY, NOTHING IS LEFT TO SURVIVE ON!

AND THESE CHEMICALS YOU SPENT FOR DESTROY OTHER SOURCES OF PROTEIN LIKE MUDFISH, CRAB, SNAILS ...

ME TOO (GASP)!

FOLIDOL M50

NOT ONLY THAT! THEY POSE DANGER TO YOUR HEALTH. YOUR BARE FEET GET INFECTED BY THEM!

WELL... BUT BECAUSE OF HYV, OUR REGION IS NOW RICHER THAN OTHER REGIONS. YOU SEE, HYV MEANS HIGHER CROP YIELD AND FAVORS FROM THE GOVERNMENT AND FOREIGN AGENCIES LIKE LOANS, DAMS, AND IRRIGATION. AREN'T THOSE SIGNS OF PROGRESS?

LOANS

LAND BANK

BUT NOT THE WHOLE REGIONAL POPULATION PROSPERS! ONLY THOSE WHO CAN AFFORD MORE INPUTS LIKE FERTILIZERS, PESTICIDES AND MACHINERIES GET THE WINDFALL.

FERTILIZER

BIONEX

CRACK CRACK CRACK

AND THOUGH THESE INPUTS MAY BE GOOD, IT IS SAD TO NOTE THAT THESE EVENTUALLY CAUSE THE IMBALANCES IN ECONOMY AND ECOLOGY.

GREATER LAND PRODUCTIVITY BUT ONLY FOR A SHORT TIME. SOONER OR LATER, SOIL FERTILITY DECREASES. THIS IS AGGRAVATED BY THE INCREASE IN TOXIC RESIDUES IN SOIL DUE TO CHEMICALS.

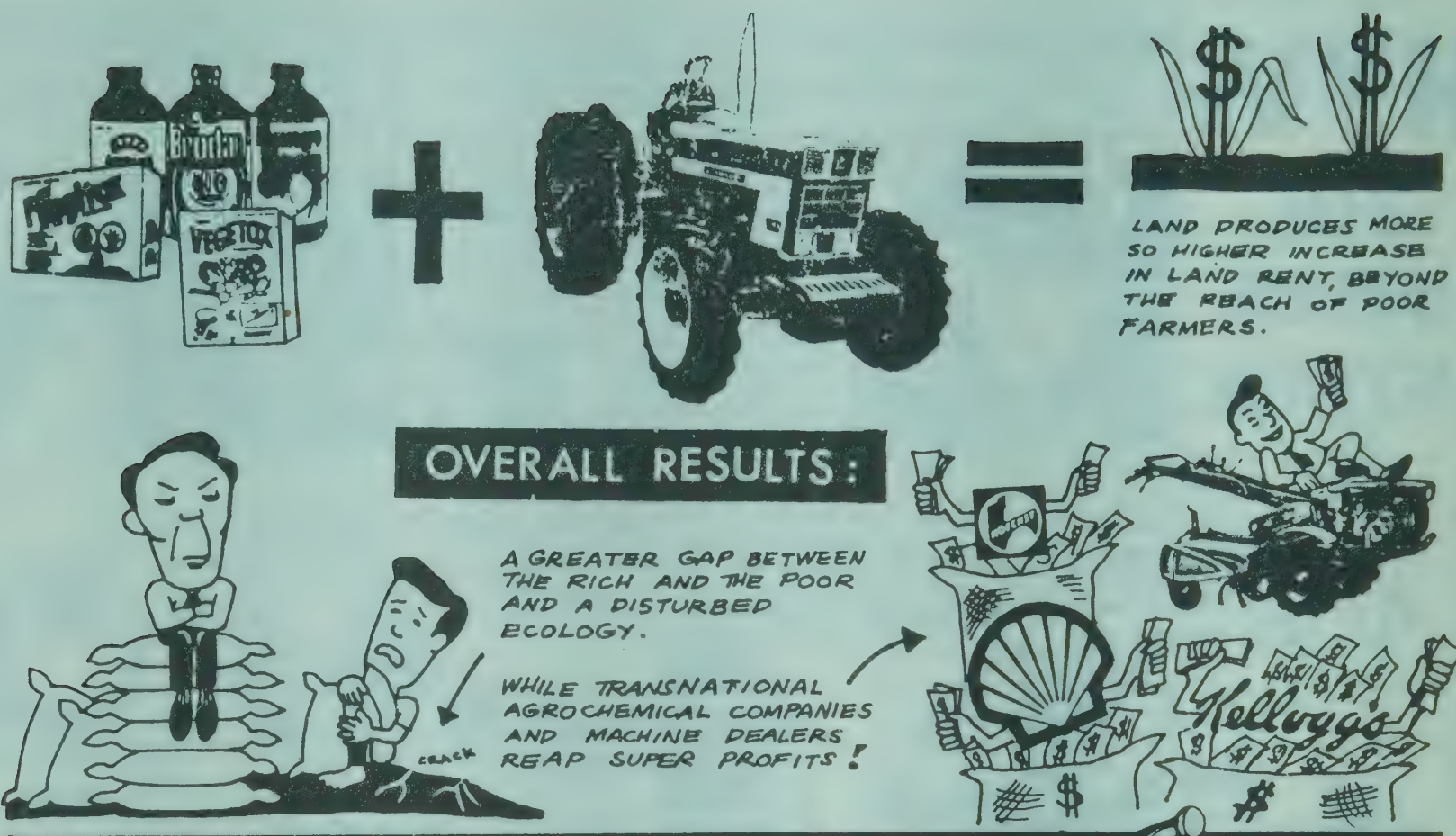
MACHINES BEGIN TO REPLACE FIELD WORKERS.

AND

THE TRADITIONAL BAROG THRESHING IS NO LONGER POSSIBLE.

THERE'S NOTHING LEFT TO GLEAN...

* BAROG - PROCESS OF SHAVING THE ALREADY-BEATEN STALKS TO GLEAN OFF THE GRAIN THAT REMAINS.


Brontax
Fastox
LAND PRODUCES MORE SO HIGHER INCREASE IN LAND RENT, BEYOND THE REACH OF POOR FARMERS.
OVERALL RESULTS:
A GREATER GAP BETWEEN THE RICH AND THE POOR AND A DISTURBED ECOLOGY.
WHILE TRANSNATIONAL AGROCHEMICAL COMPANIES AND MACHINE DEALERS REAP SUPER PROFITS!
Kellogg's
BUT IS NOT OUR COUNTRY IMAGE IMPROVED BY OUR EXPORT ORIENTED ECONOMY?
ONLY IN THE REALM OF IMPRESSIONS. BEHOLD, THE "IMPRESSIVE GOVERNMENT"!
AND THAT'S THE PROBLEM! IT'S JUST AN IMPRESSION. THE TRUE PICTURE IS THIS:
A AN UNBALANCED DISTRIBUTION OF WEALTH. THE RICH GET RICHER, THE POOR POORER.
B THE RURAL PUSH THAT SWELLS THE NUMBER OF URBAN POOR.
C DECREASE IN PEOPLE'S NUTRITION BECAUSE ONLY ONE STAPLE IS GROWN; OTHER HIGH PROTEIN LEGUMES WHICH BEFORE WERE GROWN WITH TRADITIONAL VARIETIES ARE NOW KILLED BY CHEMICALS APPLIED TO HYVs.
D DECLINE IN GENETIC DIVERSITY.
E GRAINS COST LESS; FERTILIZERS AND PESTICIDES COST MORE. MONEY EARNED FROM EXPORTED GRAINS IS NOT ENOUGH TO PAY FOR THE CHEMICALS IMPORTED SO ONLY THE INDUSTRIALIZED COUNTRIES PRODUCING THESE CHEMICALS PROFIT.
NOW, I AGREE. WITH HYV, TRUE PROGRESS IS YET TO BE SPELLED OUT...

(Source: Balai, Asian Journal, No. 7, 1983)

CHAPTER SEVEN

DOMESTIC PRODUCTION OF RICE

From 767,640 hectares in 1981, the total area under padi cultivation was expected to increase by 0.4 per cent to 771,080 hectares in 1982. Of this, 641,530 hectares was provided with irrigation facilities in 1982 (compared to 623,350 hectares in 1981), while the area under double cropping was expected to increase from 221,550 hectares in 1981, by 1.2 per cent to 224,250 hectares in 1982.

From 1,370,000 tonnes in 1981, domestic rice production was expected to decline marginally by 0.3 per cent to 1,365,900 tonnes in 1982, with Peninsular Malaysia accounting for 81.6 per cent of total rice production, followed by Sarawak (11.9%) and Sabah (6.5%). In line with the government's efforts to provide more irrigation facilities and wider application of fertilizers, total rice production was estimated to increase by one per cent in 1983 to 1,379,560 tonnes.

Domestic production of rice in 1982 was estimated to be sufficient to satisfy 79.7 per cent of domestic requirement, with the shortfall being compensated by massive imports. During the first six months of 1982, the National Padi and Rice Authority (LPN) imported rice, from Thailand, Republic of China and the U.S., to the tune of 254,500 tonnes valued at $226.9 million (compared to 152,200 tonnes valued at $140.9 million during the same period in 1981).

In the light of the modernization of the agricultural sector, and the introduction of fertilizer responsive, pesticide-dependent HYV's, both the quantity and costs of chemical inputs have shot up markedly over the past decade or so. As the local chemical industry is unable to meet the ever-increasing demands of fertilizers and pesticides, the government has resorted to large-scale imports of agricultural chemicals which are subsequently sold at subsidised rates to padi farmers.

With escalating application of fertilizers to achieve higher productivity via HYV's, domestic consumption of fertilizers was expected to increase from 1,229,500 tonnes in 1981, by five per cent to 1,291,000 tonnes in 1982. For the whole of 1982, the total domestic output of fertilizers, estimated at 415,800 tonnes, was sufficient to meet only 32.2 per cent of total domestic consumption.

Inadequate supply, higher costs of domestic production and lower prices of imported fertilizers formed the impetus for increased imports from several countries. During the first six months of 1982, 429,437 tonnes of all kinds of raw fertilizers, valued at $142 million, were imported primarily from Australia, Japan and Canada (compared to 390,500 tonnes valued at $178 million during the same period in 1981).

In 1982, total imports of fertilizers required to supplement increasing domestic consumption was estimated to increase to 900,000 tonnes (compared to 739,565 tonnes in 1981). Break-up of total domestic consumption of fertilizers in 1982 was as follows: FELDA (27%), RISDA (3%), FELCRA (2.5%), Private Estates/Small Holdings (51.5%) and Agriculture Department (16%). Domestic consumption of fertilizers in 1983 is projected to escalate even further, necessitating even more imports as domestic production, estimated at 440,750 tonnes, would suffice to meet only 32.4 per cent of domestic requirement.

Like fertilizers, domestic consumption of pesticides have increased markedly over the past few years, largely as a means to protect highly susceptible HYV's against the onslaught of pests and pathogens. Estimates indicate that over 2,000 tonnes of insecticides were imported in 1983 alone. Out of the total sales of agricultural chemicals and pesticides in 1981, which amounted to $550 million, pesticide sales amounted to a substantial $130 million (as compared to $70 million in 1976). According to one estimate, total imports (both liquid and non-liquid forms) of insecticides, fungicides, weedicides, herbicides, rodenticides and other pesticides amounted to 4,232,437 litres and 2,520, 194 kg in 1979 (valued at $73,656,800) and 5,072,909 litres and 3,038,211 kg in 1980 (valued at $88,542,900).

CHAPTER EIGHT

SEED BREEDING AND DISTRIBUTION SYSTEMS

In cases where there is inadequate genetic variability within the given base population, the required genetic variability could be fostered by hybridization of different varieties (otherwise, relatively simple mass selection/pure-line selection/clonal selection breeding methods may suffice to attain desired varieties).

Among the various hybridization techniques, which revolve around crossing of different varieties, are the following methods:

(a) Pedigree method

It is used to breed a new variety possessing a combination of desirable traits from different varieties (primarily for improving self-pollinated crops). As new recombinations of genes originate only by hybridization, it is vital before hybridization, to carefully select the parents for the cross with a definite objective in mind. Despite being a tedious method, it has been employed for rice breeding in Malaysia and has given rise to varieties like Bahagia and Ria.

(b) Bulk method

A modification of the pedigree method which is commonly adopted for improvement of self-pollinated crops.

(c) Recurrent selection method

Involves selfing one generation and subsequent intercrossing among the selected selfed lines or individuals. The purpose of selfing is to eliminate the frequency of undesirable genes in the population and to simultaneously increase the frequency of superior genes in the gene pool. The recurrent selection method can be modified to improve both cross-pollinated and self-pollinated crops, and can assume various forms depending on how the selfed plants are selected.

(d) Backcross method

Used chiefly to transfer a desirable trait or traits from one variety to another variety which is more acceptable with regard to other agronomic characteristics. The backcross method, applicable to both cross-pollinated and self-pollinated crops, can be employed to tansfer inherited traits like resistance to pests and pathogens.

Food Justice Centre

Seeds in the hand.

AVRDC

Checking the seed bank.

(e) Synthetic varieties method

Such varieties are maintained from open-pollination seeds after synthesis via hybridization in combinations among a number of selected genotypes that manifest good compatibility or combining ability. The primary aim of this method is to exploit hybrid vigour under field conditions.

(f) Interspecific hybridization method

When plant breeders find that the genetic variability within a species is exhausted, new characters not present in the species may be incorporated by interspecific hybridization. The method can be utilized to create a new species or even to generate novel plants.

(g) Mutation breeding method

On occasion, a desirable gene cannot be transferred from one variety to another variety, since the desirable gene is intimately linked to an undesirable gene. Under such circumstances, induced mutation may be an alternative worth exploiting. The method is useful in fostering genetic variability within a population, especially among sexually propogated crops.

(h) Polyploid breeding method

A kind of mutation breeding which involves changes in the chromosomal number of a crop. However, due to technical difficulties, and the development of undesirable traits in the offspring (e.g. genetically unstable auto-polyploids), induced polyploids have not been widely adopted (excepting in certain crops such as seedless water melons).

In order to harness the full benefits of an improved crop variety, the variety needs to be distributed widely, for which sufficient seeds must be produced and maintained. Theoretically, to obtain the best results, a farmer has to ensure that every seed he grows is of a genetically uniform improved variety - a situation

that seemingly promises certain advantages like uniform ripening and easy harvesting (notwithstanding the concomitant higher susceptibility to pests and pathogens).

To maximise returns from the use of improved crop varieties, it is imperative that there exist practices to facilitate systematic increase and rapid distribution of seeds. In the development of such practices, two assumptions are generally made:

(i) development of a variety is the principal function of the plant breeder.
(ii) increase and distribution of varieties can be handled most expeditiously by those well versed in the art of growing, clearing and distribution.

In line with the aforesaid two assumptions, rice seeds may be broadly classified into four types:

(a) Breeder seed

Propagating material directly produced or controlled by the originating plant breeder, and which provides the source for the increase of foundation seed.

(b) Foundation seed

Direct increase from breeder seed; the genetic identity and purity of the improved variety is maintained and production carefully supervised.

(c) Stock/Registered seed

Progeny of foundation seed or stock seed itself maintains satisfactory genetic identity and purity of the improved variety for subsequent production of certified seed or extension seed.

(d) Certified/Extension seed

Produced from stock/registered seed for distribution to farmers for field cultivation.

In Malaysia, where there is neither an official seed certification scheme, nor a private seed trade, the multiplication and distribution of improved seed varieties is undertaken by the government through the Department of Agriculture (DOA). Consequently, breeder seed is maintained by the institute which bred the variety; foundation seed is maintained by the concerned institute of the DOA; multiplication of stock seed and extension seed is the responsibility of the DOA, seed produced on farms is sold back to the DOA; and distribution of improved seed is usually done on an exchange basis.

According to farmers belonging to various Farmers' Organisations in Malaysia, the common problems encountered in the purchase of seeds include untimely supply, lack of proper storage facilities, difficulty in finding suppliers, difficulty in getting recommended varieties, distance of supply source, transportation shortcomings and prohibitive prices. Other problems associated with the quality of commercal seed are low germination rate, preponderance of broken/dead seeds, infestation by insects and micro-organisms, doubtful genetic purity and improper moisture content.

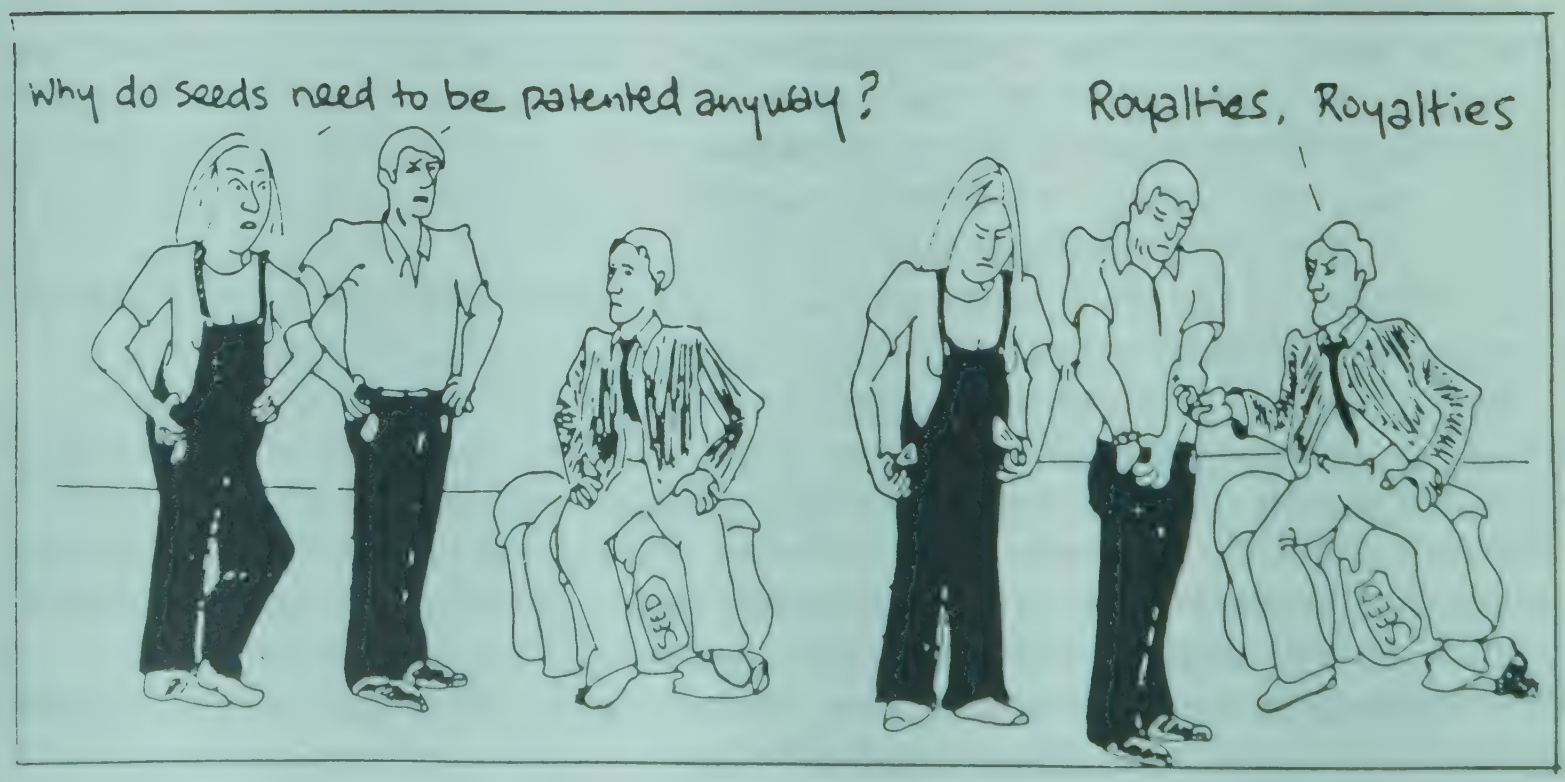
CHAPTER NINE

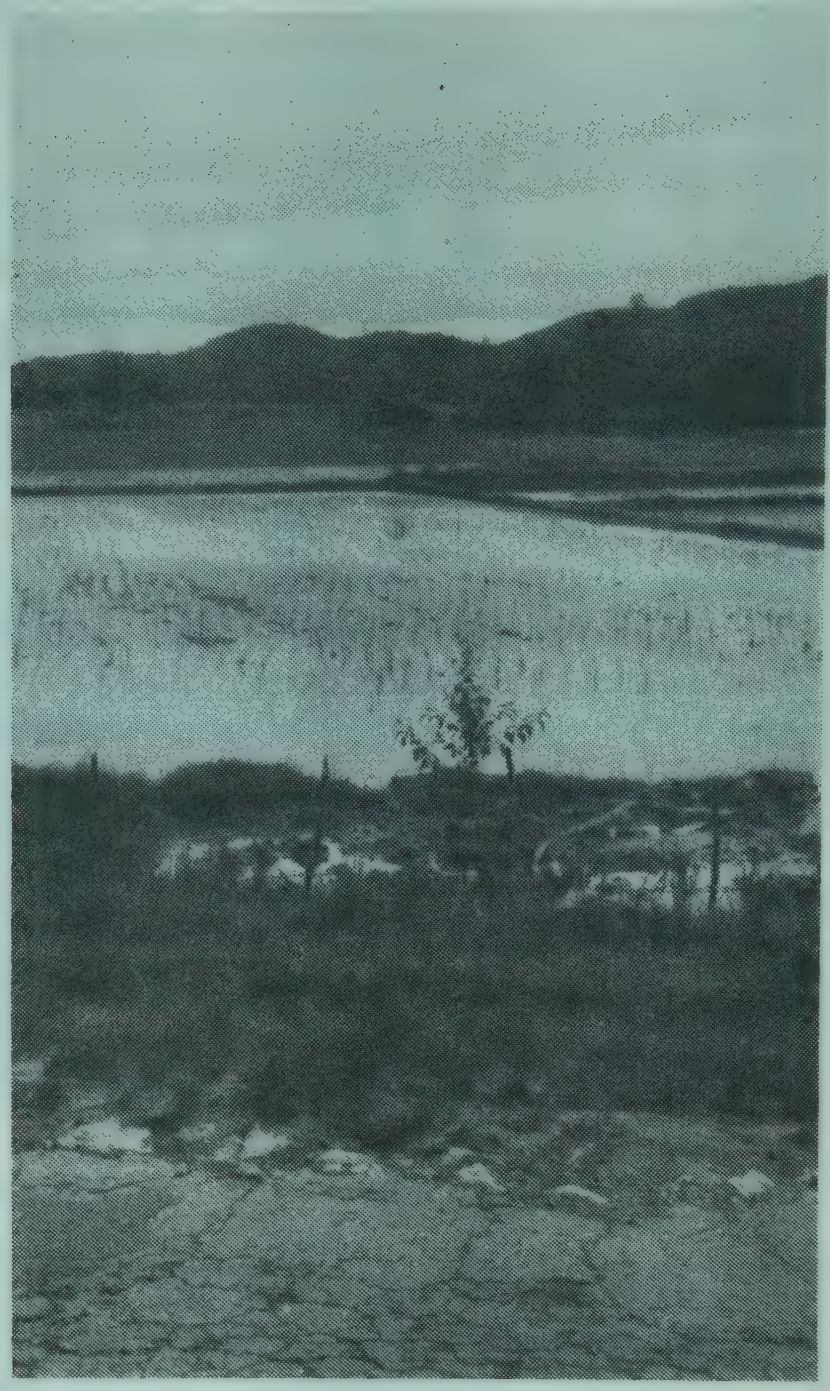
SEEDS ACT AND GENETIC CONSERVATION

With the onset of the Green Revolution, and the widespread introduction of HYV's, the genetic bases of food and cash crops have been steadily eroded through the phasing out and disappearance of traditional varieties of seeds. Realising the potential for large financial returns and the eventual control of agriculture practices, transnational corporations have stepped in to exploit the genetic resources of developing countries blessed with a rich genetic heritage. Each year, it is estimated that over $12 billion worth of seeds are siphoned off from the earth's critical seed stores just to meet the demands of conglomerates involved in the global seeds trade. If this dangerous trend is left unchecked, then in due course, several species of commercially esteemed crops would simply vanish from the face of the earth and the future of the world's food supply greatly threatened, with terms being dictated by a handful of multinational companies.

With regard to genetic conservation of rice in Malaysia, it is noteworthy that the MARDI managed Rice Research Station at Bumbong Lima, in Province Wellesley, maintains rice seeds in a Koitotron seed bank (with duplicate seed samples stored separately in a cold room) which has a temperature of less than 10°C and a relative humidity of 60 per cent.

At present, rice germ plasm collections at Bumbong Lima number over 4,450 accessions, of which 3,500 accessions have been fully catalogued for all the required characters, while the rest are in the process of being evaluated and





Paddy fields in Malaysia.

catalogued. Fifty per cent of the accessions comprise indigenous varieties, with the other 50 per cent representing exotic varieties originating from 28 countries (through the courtesy of the IRRI in the Philippines).

Malaysia does not have a National Seeds Act, and will not enact one in the forseeable future as local seed production and distribution, introduction of HYV's and research on various facets of seed technology are strictly a government affair. Since the seed business in Malaysia has not been commercialized by private intervention as yet, the government sees no need for a Seeds Act.

However, from the experience of other Third World countries, it would be advisable for the government to establish a national seed bank for the benefit of plant breeders, as well as to prevent seeds of commercially important plants from becoming extinct. Unfortunately, Malaysia has so far not had a proper storage or record of its seed resources and, consequently, certain valuable plant species in the country have virtually disappeared due to their seeds being either discarded, destroyed or exported to other countries. If the export of local seed resources is allowed to continue, then Malaysians might one day have to purchase at exorbitant prices seeds developed overseas from indigenous varieties, which are covered by patents by foreign seed companies.

CHAPTER 10

A CASE STUDY OF MALAYSIA

In early 1982, Sahabat Alam Malaysia carried out a survey among rice farmers from Province Wellesley, Seberang Prai, Kepala Batas and Kedah. The survey questionnaire sought data on personal information, new seed varieties and HYV's, fertilizers, pest control and miscellaneous expenses.

Results of the survey have been summarized below:

(1) Over 60 per cent of the farmers had families comprising four to six members.

(2) Over 65 per cent of the farmers earned between $500 to $2,000 per season from padi cultivation, with 70 per cent of the farmers having additional incomes of less than $500 per month as watchmen, carpenters, cooks, masons and gardeners.

(3) Over 60 per cent of the farmers cultivated padi on their own land; ownership of land was accorded by virtue of being family property (75%), purchased (20%) and fragmented (5%). Of the group that cultivated padi on rented land, over 85 per cent of the farmers paid rents raging from $100 to $200 per relong-per season depending on factors like fertility, distance from town and availability of irrigation facilities. The size of farms varied considerably, ranging from less than one relong to more than 23 relongs.

(4) Evidently, farmers switched over to new varieties of rice every three - five seasons, primarily (84%) in view of the increased income, stemming from the faster growing period (which enables double-cropping) and relatively higher harvests from HYV's. New seed varieties of rice were introduced largely by fellow farmers (52%), and to a lesser degree by the Agriculture Department and Government Agencies (33%) and Farmers Associations (15%).

(5) Procurement of new seed varieties of rice varied from exchange/purchase from fellow farmers (49%), purchase from Government Agencies at 45 cents to 50 cents per kati or 90 cents per kilo (38%) and free samples from fellow farmers (13%).

(6) Virtually all farmers agreed that since the widespread introduction of modern HYV's, there had been a marked increase in padi pest infestations, especially by "bena" (brown plant hoppers, white-back plant hoppers, green leaf hoppers), nematode worms, rodents, birds, "kutu bruang" and the "red virus disease".

(7) Farmers were divided as to whether the performance of newly introduced

Spraying pesticides in the paddy fields.

HYV's declined after two to four years, but generally agreed that during the same period, there was an appreciable increase in the susceptibility to pests and pathogens.

(8) Traditional varieties of rice were hardly cultivated (virtually non-existent in the Muda region) and have gradually disappeared over the years; only 20 per cent of the farmers had access to traditional varieties of rice.

(9) Farmers disclosed that previously a small plot of land was set aside for cultivation of rice destined for personal use or domestic consumption — a practice that has been abandoned. Interestingly, over 60 per cent of the farmers preferred to sell all the padi cultivated on their land (to exploit subsidy incentives from the government) and bought rice for domestic consumption from the open market.

(10) Although a few farmers claimed that traditional varieties of rice gave far less yield and were more prone to padi pests and diseases, compared with modern HYV's of rice which were more sturdy, performed better and gave markedly higher yields, a majority of farmers held the view that traditional varieties of rice were more hardy, more resistant to floods, pests and pathogens, better suited to local conditions, had better taste and texture, needed far less amounts of fertilizers and pesticides, irrigation, and exhibited lower breakage of padi during processing than HYV's of rice.

Given the choice, most farmers expressed a preference to cultivate traditional varieties of rice, but they also cultivated HYV's of rice due to

the increased income stemming from the faster growing period (which enables double cropping) and relatively higher yield.

(11) For HYV's of rice, crop yields ranged from 18 to 35 gunnis (sacks) per relong during the main planting season and from 16 to 30 gunnis per relong during the off-planting season; the corresponding figures for traditional varieties of rice ranged from 18 to 20 gunnis during the main planting season and 15 to 18 gunnis during the off-planting season.

Earnings from the sale of padi were dependent on the buyer — $28 to $29 per pikul by LPN; $28-50 per pikul by licensed padi processing firms; $29 per pikul by licensed padi middlemen; and $30 per pikul by illegal buyers. Further, the Government doles out a $10 per pikul subsidy if the padi is sold to Government Agencies.

(12) Most farmers purchased fertilizers directly either from retail shops or from Government Agencies at subsidised rates. Introduction of fertilizer brands was largely done by Farmers Associations (50%) and the Agriculture Department (40%). Over 97 per cent of the farmers agreed that excessive fertilizer usage brought about changes in soil chemistry and a reduction in land fertility and crop yield.

(13) Not a single farmer used only traditional fertilizers; 80 per cent of the farmers used a combination of traditional and commercial fertilizers, while 20 per cent of the farmers used only commercial fertilizers. Among the reasons given for the preference of commercial fertilizers over traditional fertilizers were: ready-made for direct application, convenient and easy to handle, greater stimulation of plant growth and availability of fertilizers at subsidised rates from the government.

(14) Application of fertilizers varied from two to four times per season, and costs incurred via purchase of fertilizers ranged from $30 to $60 per relong per season. Most farmers used UREA and MIXTURE types of commercial fertilizers, whereas Siamese and local bat guano-cum-organics (also called Baja Bukit Tanah) was the most commonly used traditional fertilizer. Only a handful of farmers could afford to use the more expensive brands of commercial fertilizers like AMMOPHOS and NITROPOSKA.

(15) All farmers resorted to pesticides as the principal means of pest control and crop protection, with application of pesticides done largely on a calendar-schedule basis at predetermined intervals. The frequency of application of pesticides varied from one to three times per season, with the approximate costs incurred from purchase of pesticides ranging from $40 to $60 per relong per season.

(16) Particular brands of pesticides were primarily introduced by local shopkeepers (65%), and to a lesser extent by the Agriculture Department (15%) and Farmers Associations (15%). Among the commonly cited brands of pesticides by farmers were: 2,4-D; Rumputox, Sogatox; Gama BHC; Thiodan; Milathion; Gramoxone; DOL-G; Methyl Carbomate; Paraquat; "Cap Tengkorak" (Skull Brand); "Cap Obor" (Torch Brand); "Cap Labah" (Spider Brand); and "Cap Kepala Ayam" (Rooster Head Brand).

(17) While 80 per cent of the farmers claimed that pesticides were the most effective means to control pests and pathogens, all farmers agreed that effectivity steadily declined after prolonged use (nessitating switching over to more toxic pesticides, mixing of various brands or increasing dosage/frequency) and that excessive application of pesticides invariably brought on a host of environmental and human health problems.

(18) Over 90 per cent of the farmers could not read the warnings on the labels or realise the hazards associated with toxic pesticides, leave alone the need to adopt precautionary measures during application operations. When confronted with pesticide related problems, farmers generally sought the advice of MADA, MARDI, the Agriculture Department, Farmers Associations or fellow farmers.

(19) Other expenses incurred by farmers involved in padi cultivation included ploughing expenses $50 to $100 per relong per season), planting expenses ($40 to $120 per relong per season), harvesting expenses ($40 to $120 per relong per season), trashing expenses (approximately $60 per relong per season in the absence of an automatic harvester) and transport expenses (approximately $80 to $100 per relong per season depending on distance and condition of road).

(20) By far, the most commonly cultivated HYV of rice encountered during the survey was Seribu Gantang, followed by Mahsuri, Anak Dara, Setunjang, No. 6, Apollo, MR 1, Padi Merah, Sekenchang, Tiga Bulan, Kada Ria, Padi Bulat and MR 27.

Among the traditional varieties of rice that were still cultivated in small patches were the Intan Putih, Gantong Halu, Ria, Intan Merah, Kertek, Bahagia, Sepot and Sesat Kelabu.

According to the older farmers, the following traditional varieties of rice were widely cultivated before the Muda irrigation scheme was launched:

(a) Mayang Pasir
(b) Mayang Bongor
(c) Mayang Kelubi
(d) Lawang Lawi
(e) Pucuk Nipah
(f) Sesat Ringan
(g) Taiwan
(h) Jarum Perak
(i) Mayang Ibuih
(j) Lembut Pandan
(k) Batu
(l) Benua
(m) Anak Didik
(n) Guai Putih
(o) Guai Merah
(p) Sesat Tok Haji Man
(q) Padi Intan
(r) Pulut Sutera

It is virtually impossible to encounter the above cited traditional varieties of rice today. Even the farmers are not aware if the seeds for such traditional varieties exist or not, let alone where they can be found. Interestingly, in the past, specific traditional varieties, based on smell, colour, texture and taste, were associated with particular auspicious occasions like the arrival of a new baby, weddings and other festivals/ceremonies.

CHAPTER 11

TRADITIONAL PRACTICES OF FARMERS

There are a great number of differences between current padi cultivation and cultivation as was carried out in the past. These differences arise out of the actual process of cultivation itself. Previously, farmers relied greatly on traditional methods of land tenure, fertilization, killing of pests and other activities associated with cultivation. The actual way of life, too, contributed towards shaping agricultural patterns.

The influence of the elders in the community, played a vital role throughout the cycle of cultivating the rice fields.

The farmers would collectively decide when to actually start cultivation at meetings, which would often be held at the mosques where they gathered for prayers, or at religious feasts.

The agreed day of the start of the padi cultivation would see the farmers bringing their water buffaloes and weedcutters, on to their fields along with their traditional breakfast of "kopi" (coffee) and "pulut" (glutinous rice).

The padi seeds that are to be sown in the nursery, have been selected and stored separately from the rest of the padi which is stored in the rice barn.

These seeds are of a high quality. They are not harvested or thrashed with the other padi but are instead left to dry on the plant and later cut at the stem with a small knife that is especially used for reaping grain known colloquially as "renggam."

Only in this way, can seeds that are ripe and of good quality be selected. The seeds that are to be sown are washed first to remove the padi husks. The seeds are then soaked in water for three days and nights until they swell and sprout shoots, a term known as "pecah mata".

After this, the seeds are removed from the water, and left to dry for a period of two days. During this period, the farmer carefully prepares his nursery. The padi is sown in the mornings and the evenings following specific times.

The seedlings are left to grow, with the aid of fertilizers for a period of 30-40 days after which they are considered to be fully grown.

At this stage, when the seedlings are ready to be plucked or uprooted, the farmers collectively hold a religious feast and pray for blessings and protection to ensure that their crops will not be spoiled or damaged.

Edible items at the feast include glutinous rice with dried fish, and coffee, the farmer's typical breakfast.

Once the feasting is over, the farmers return to their nurseries and start plucking the seedlings.

An interesting thing to note is that before the seedlings are planted in the

fields, the head of the farm plants black glutinous rice and a handful of seedlings in the middle of the field. The farmer believes that this will control the "padi spirit" and will protect their crops from pests whilst at the same time, increasing their yield.

A very important aspect to the traditional way of cultivation is the "berderau" system. The literal translation means "work in cooperation," and the system encourages co-operation, unity and a willingness to help each other, which makes for the smooth functioning of the society as a whole. The actual planting is carried out in a big group. The workers are divided into groups of 10-20 persons, comprising both males and females. The men carry the seedlings onto the field and the women plant the seedlings handed to them.

This "berderau" system therefore, lightens the workload considerably and saves a lot of time and effort. This co-operation and unity is not only manifested in the fields but also at religious feasts and at times of hardships such as illness and death.

Since the farmer is expected to only provide meals, the system also helps him to save on expenses that would have otherwise be incurred as wages. Moreover the act of working together in unity and harmony takes away the physical monotony of working in the hot sun. Each farmer is aware of the needs and problems of his neighbour, since they are all in the same boat so to speak, and this once again is a uniting factor.

Once the planting work is finished, the farmers must return to the fields regularly, to remove weeds and grasses, add fertilizer and keep a watch out for any padi that is not growing. A padi plant that is not growing has to be replanted immediately and replanting is normally carried out in the daytime.

Each time the farmer goes to the field, he carries out a unique exercise.

At the ridge on bend just before the field proper, the farmer starts walking around the field, beginning from the left side and finishing at the place he started, all this while sprinkling grass and water.

This act is once again believed to control the "padi spirit." To ensure a flourishing crop, the farmer must not disturb anything living in the water such as fish, crabs, frogs and weeds which provide food for aquatic life. He is also forbidden to kill dragonflies, spiders and birds.

These creatures, are therefore allowed to grow and multiply in peace. They help to discourage insect attacks on the padi. The fishes for instance feed on worms and the spiders' webs trap bugs and other insects.

The farmers carry out other activities which display their resourcefulness. For instance, they plant glutinous rice, which is a breakfast food for them, as well as being an additional source of revenue.

Whilst working in the fields, the farmers also trap fishes using nightlines.

In this way, they do not have to buy fish, which is an important part of their diet. Freshwater fish have as high a protein content as do saltwater fish.

Nightline fishing occurs when the farmer places small fishing hooks in between the padi plants between distances of 15-20 feet. The bait used are frogs, crabs and grasshoppers. The lines are placed in the water paths, and grasses are put on top of the equipment, to provide shelter for the fish.

It is not uncommon for each farmer to have a pond, in which to breed fishes.

The pond is usually surrounded by screwpine trees and never dries up. It is therefore an ideal place to rear fish who in return help the farmers by eating insects.

Farmers before, did not destroy all the trees found in their padi fields. The ''gelam'' tree for instance, was often used by the farmer as a place of shelter. This tree is big and tall, and its wood is very strong and it was therefore used for constructing houses and bridges.

This tree is also a haven for birds, especially the eagles, who enjoy building their nests here and in return prey on insects and rats. These birds are therefore an advantage to the farmer, who has the good fortune of not having to spend money on insecticides and pesticides.

The farmer usually builds his house in the middle of his field, and rears cats, buffaloes, goats, chickens, ducks and geese.

Having these animals are an added advantage. The cats feed on rats and thus prevent damage being done to the crops.

The farmer feeds his buffaloes with grass from the bank of the field as well as from the field itself. This continual cutting of the grass, prevents rats and snakes from making their nests there, and so helps the farmer.

The buffalo produces milk, which besides being used for drinking purposes can be used to make ghee & cream. The buffaloes are also used by the farmers to carry padi during harvesting.

Chickens and ducks, besides providing food for the farmer and his family also generate income when they are sold. The farmer who rears geese will find for himself a readymade watchdog as geese are known to be extremely ''vocal'' on sighting strangers!

The excreta of the chickens, goats and ducks is used as fertilizer. Goat excreta, is, as a fertilizer, extremely beneficial to the padi plant. According to the farmers, goat excreta is extremely unpopular with rats and as such when used, keeps rats away from the padi plants. This again is one of the numerous farming "tips" practiced by farmers of before.

Many of the farmers rear pigeons, because besides being used in the making of medicines,pigeons by eating worms, help to keep the insect population at a minimal level.

To prevent any land from lying idle, the farmers plant coconut, papaya and cashew nut trees along with lemon grass, ginger and other short-term vegetable plants. These plants besides providing food, also have other uses such as in the formulation of traditional medicines. The coconut tree, for example, besides being a place for shelter, is also a favourite place for birds to build their nests. The weaver bird is especially fond of nesting in the coconut tree and enjoys feeding on worms in the padi field.

Bamboo trees are planted around the houses with the intention of protecting the houses from strong winds. The bamboo is also used to make fishing aids, chicken coops and platforms for their houses.

By the time, the padi starts turning yellow, the population of birds as well as rats increase because of the increase in their food supply.

The farmers, place a large fishing net across the field in the style of a movie screen. They believe this keeps the rats away. The farmer and his family also fly kites in their free time. The farmers say that rats will be frightened away by their playing kites, especially by the noise created. Kite flying is extremely popular at this time. The kites are left in the air from the evening through the next morning in the belief that it will keep the rats away from the padi.

When the padi is ripe, harvesting and threshing is carried out, based once again on the system of "berderau." Sacks are filled with padi and then transported off the field by buffaloes, each buffalo being capable of pulling 4-5 sacks at a time.

The padi is dried, aired, then weighed. The neccessary Islamic Tithe or "Zakat" is put aside for the poor and the needy. The padi is then stored in barns. Women are not allowed to enter the rice-barn as they otherwise believe the padi 'spirit' will be lost. Padi is also not removed from the barn, neither is it sold on Fridays.

At the end of the cultivation period, a feast of "new rice" is held. In the States of Sabah and Sarawak this is known as "Pesta Menuai."

Before the feast is held, the farmer goes to the pond in his field to catch fish. This is the only time in the year when fish is caught from this pond. The fish is carried and served at the feast. The excess fish is sold or dried for daily consumption.

Once the harvesting and feasting are over, wedding ceremonies occur. Some of them have chosen their partners from the same village whilst harvesting and others, especially daughters have their marriage partners chosen for them by their elders.

The feast does not mark the end of work. It is a manifestation of the farmers thanks for a successful crop.

FAO

Winnowing rice in Burma.

The farmers keep themselves busy by making plaited mats, baskets, bags and other items from screwpine leaves. Both the men and women cut the leaves but the actual weaving is done only by the women.

Farmers who have nipah trees at the side of their houses use it to make atap. String is easily available from nearby shrubs. The atap is sewn, fastened and dried together before being used.

Bamboo is used to make fishing aids, which the farmer uses to catch fish from his pond. The bamboo is also used to make fish traps and baskets to store the fish in. These are only a few of the various items made.

At this time, the farmer too takes the opportunity to repair his equipment.

Farmers with orchards replant them with new trees. The padi season preceedes the fruit season. The farmers keep a close watch on their trees as some of them such as the durian tree, need to be carefully looked after.

The community as a whole, holds "Dikir" sessions. It is similar to the "boria" typical of Penang in which bands of musicians serenade houses. During the Dikir, religious verses are chanted. Dikirs are commonly held during feasts, such as feasts held during the birth of a baby. When a baby is born, the feast is held one week after the birth. This feast is known as "berendoi" and during the feast, held at night, the baby is placed in a lavishly decorated cot.

The farmers plant a variety of trees, for food and other purposes. The farmers in those days did not have access as we do today to hospitals and clinics and

greatly used plants for medicinal purposes.

Children who suffered from worms and poor appetite were given the leaves of the papaya tree. The leaves were soaked in water and the child was bathed in this water for a period of 3 days.

Betel leaves when mixed with jasmine flowers were used to cure fever as well as bleeding nose.

The pandan leaves, with their well-liked fragrance, were used in cooking and also added to rice powder.

Sugar canes were planted, and supplied the famer with his sugar.

Therefore, ultimately, the farmer seemed to have a use for practically everything growing around his house.

A combination of accepted farming trends with the skill and sharp-sightedness inherited from their ancestors, has resulted towards their success as padi cultivators.

The key to their success is their system of unity and agreement in cultural, religious and agricultural aspects. The "Berderau" system has proven to be a sound and wise system which does not make a distinction between the rich farmer and the poor farmer but rather unites them because they feel a responsibility towards each other.

CHAPTER 12

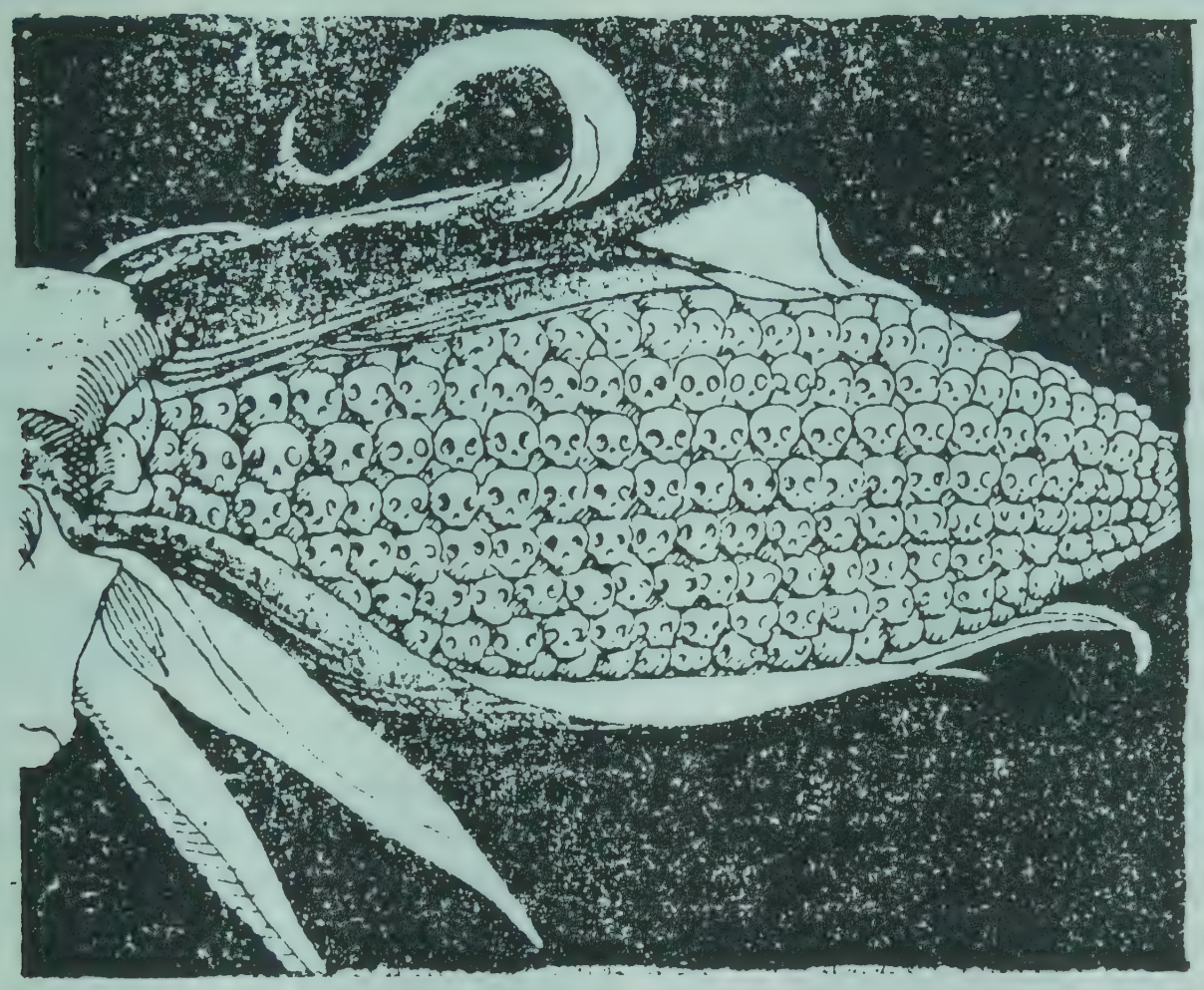
FIGHTING THE SEED REVOLUTION

Some Third World farmers are opting out of the Green Revolution and returning to traditional crop varieties, because the so-called greening of the Third World is not working for the poor of many countries. The Green Revolution is only the most visible part of a much larger agricultural revolution — the 'Seed Revolution'. This revolution is relatively guided and controlled by a small number of multinational/pharmaceutical companies which are moving into the seed industry. The 'Seed Revolution' is aided by two key trends: the leaning of the Third World towards a second Green Revolution with the multinationals controlling plant breeding; and, an attempt in the First World to create patent-equivalent protection and market control of seeds for the multinational interests.

Little is known about the 'Seed Revolution', much more must be looked for. The following is a summary offered for further discussion and study:

a. The world looks to a handful of plants for its survival. Be it wheat, maize or rice, each of the earth's major crops has its genetic home in the Vavilov Centres of genetic diversity, located in the Third World. Although everyone draws from the germ plasm in these areas to maintain food supplies, the gene-hungry nations of the First World are especially dependent upon the Third World for their crop survival;
b. The mythology of the 'population explosion' has led to the spread of 'high-response' plant varieties via the Green Revolution. New varieties are replacing traditional cultivars and wild relatives in the centres of genetic diversity, wiping out sources for future plant breeding and leaving traditional farmers wholly dependent upon expensive new varieties;
c. Global companies have virtual control over the second phase of the Green Revolution, allowing them to 'package' inputs of seeds and chemicals with the help of government subsidies, foreign aid and higher farm prices;
d. As a result, agrichemical firms have constructed a global distribution system and marketing strategy for their seed and chemical products at the same time as competition from traditional crop varieties has been reduced;
e. There is a widely-held illusion that vanishing germ plasm is being safely stored in regional and global gene banks. In fact, these banks are poorly funded and have experienced disastrous equipment failures resulting in the loss of precious genetic resources. More collections are urgently required in almost every part of the world;
f. The emerging network of gene banks takes national genetic treasures from

the Third World to be stored abroad. In effect, these national resources cross a technological frontier, robbing the world's original plant breeders — subsistent farmers — of their rightful heritage, and leaving Third World governments dependent upon the First World for access to their own germ plasm. In Africa, examples already exist where nations have paid to import the immediate genetic offspring of their national resources;



g. An unknown factor in genetic conservation programmes is the extent of corporate collections. It is known that in some crops a single enterprise dominates total world germ plasm holdings;
h. Protected by restrictive varietal legislation (patents), agrichemical/pharmaceutical firms in the First World are moving aggressively to achieve variety control in major markets. Smaller seed companies are quickly disappearing. Public sector plant breeding is being virtually forced into doing basic research in areas of interest to the dominant companies;
i. Agrichemical corporations seek the development of plant varieties best able to stimulate chemical sales. The resulting bias can lead to greater crop uniformity and disease vulnerability as well as increased financial and environmental costs. The largest enterprises have created genetic research centres, cross referencing plant, animal and human chemical research;
j. Because of their involvement in several phases of the total food system, agribusiness plant breeders look to profits from several sectors. This enables them to breed seed suitable to their chemical, processing or retail interests, but not necessarily suitable to the profitability of the farmer or the nutrition of the consumer.

RECOMMENDATIONS

The 'Seed Revolution' is far from over or complete. It can still be stopped and developed in such a way as to achieve genetic diversity and greater public involvement in conservation and breeding. It is not too late. The almost total interdependence of First World and Third World germ plasm requirements gives hope that international cooperation can guarantee the Third World control over its over plant genetic heritage, while allowing the First World fair access to needed plant material.

A. Regarding Germ Plasm Conservation

1. A global germ plasm collection campaign be launched through the auspices of the International Board for Plant Genetic Resources, (IBPGR) directed to the collection of both land races and wild species. Such a campaign should begin immediately and should be well funded.
2. Collected genetic material be stored in the country where it is collected in long-term storage vaults, where it can be adequately documented and rejuvenated as appropriate. We also recommend that staff be trained within each country so that they will be able to collect, conserve and document plant material;
3. A system of genetic reserves be created in each of the Vavilov Centres where, as far as is practicable, native vegetation may be allowed to flourish;

B. Regarding International Legal Arrangements

1. The United Nations — through such organizations as the UNDP, FAO, and World Intellectual Properties Organization — take appropriate steps to ensure that plants be regarded as resources of common heritage to all peoples and unsuitable for any form of exclusive control through patents, trademarks, etc. — i.e. that access to plant material be considered a basic human right;
2. The 'Code of Conduct for Transnational Corporations' specifically include provision that the seed industry be regarded as an area of vital national security, inappropriate for the involvement of international firms;
3. The 'Code of Conduct for the Transfer of Technology' include provisions guaranteeing the right of nations to protect their national botanical heritage from commercial exploitation;

C. Regarding International Action

1. 'Seeds' become an agenda item at upcoming UN conferences dealing with international trade, agricultural development, and international scientific and technological exchanges;
2. The United Nations incorporate concern for this issue in its 'Programme of Action for the Third Development Decade', and that one year of this decade be declared International Seed Year in order to launch a global conservation campaign;
3. The UN Centre of Transnational Corporations undertake a special study of the world seed industry with its pharmaceutical/agrichemical connections, with special regard to its influence on restrictive varietal legislation and the control of genetic resources;

D. Regarding Third World Options

1. Those Third World nations who have not already done so take immediate inventory of their endangered plant genetic resources and plant breeding programmes to ensure that their sovereignty over this vital area is well protected;
2. Third World governments should press for a major programme of international co-operation to collect and preserve the world's valuable genetic resources;
3. Third World governments should closely monitor the spread of restrictive varietal legislation in industrialized countries to safeguard against any threat this trend imposes upon national conservation and breeding programmes;
4. In safeguarding plant resources and food supply for future generations, we recommend that the Third World be aware of its own position in maintaining long-term world food security, and that it use its influence to promote international co-operation in conservation programmes;

E. Regarding the Role of Voluntary Agencies

1. Voluntary agencies examine their own potential for supporting collection, storage and training programmes in the Third World. Although co-operation with governments is important, we particularly commend programmes in support of the collective self-reliance of subsistent farmers already struggling to safeguard traditional plant material;
2. Voluntary agencies examine the public breeding programme and varietal legislation in their home countries to be assured that national programmes are operating with due regard to long-term food security and are not threatening the genetic resources of the Third World.

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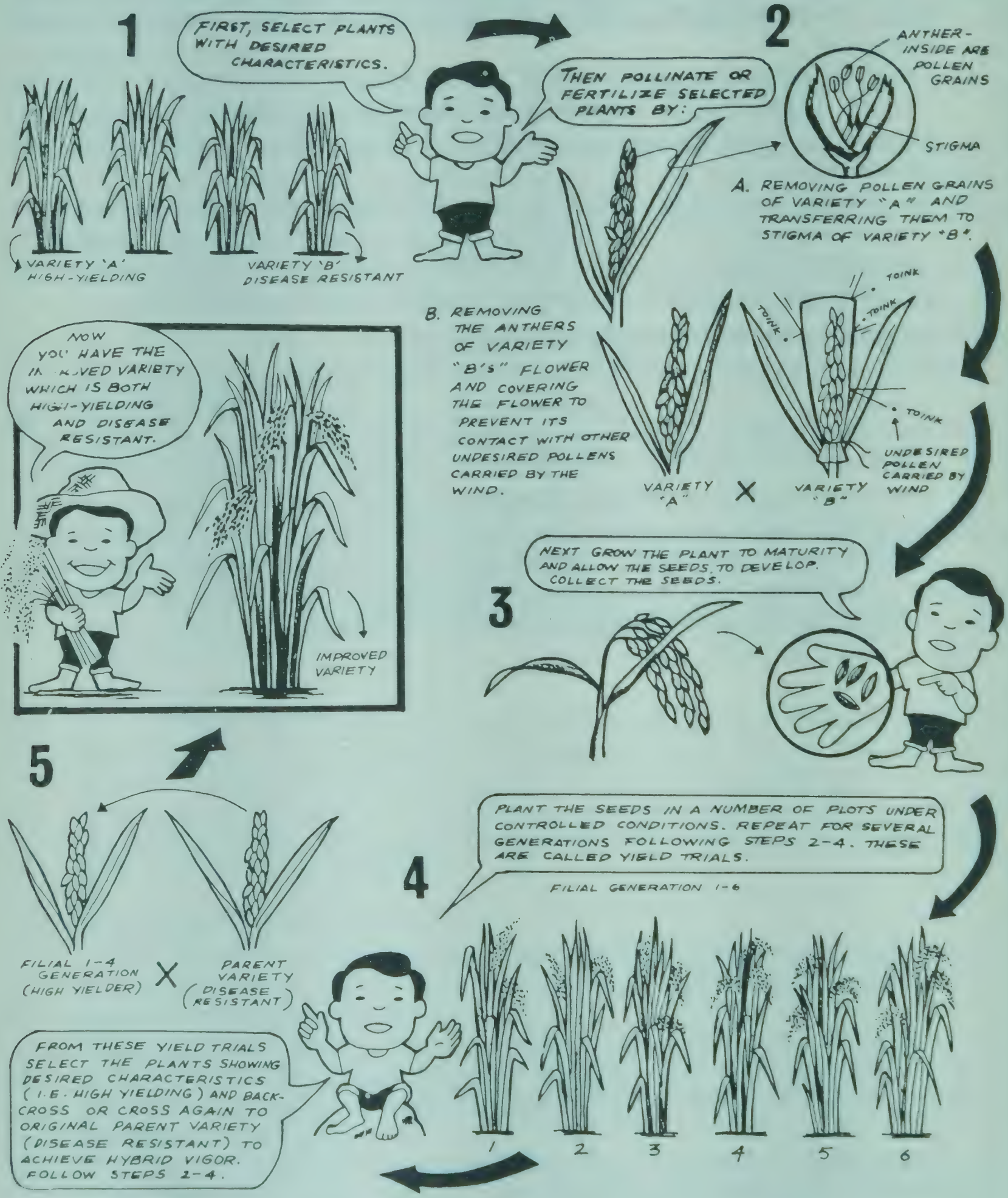
HERE'S HOW MAN CAN MAKE AN IMPROVED GRAIN VARIETY


1
FIRST, SELECT PLANTS WITH DESIRED CHARACTERISTICS.
VARIETY 'A' HIGH-YIELDING
VARIETY 'B' DISEASE RESISTANT
THEN POLLINATE OR FERTILIZE SELECTED PLANTS BY:
2
ANTHER - INSIDE ARE POLLEN GRAINS
STIGMA
A. REMOVING POLLEN GRAINS OF VARIETY "A" AND TRANSFERRING THEM TO STIGMA OF VARIETY "B".
B. REMOVING THE ANTHERS OF VARIETY "B's" FLOWER AND COVERING THE FLOWER TO PREVENT ITS CONTACT WITH OTHER UNDESIRED POLLENS CARRIED BY THE WIND.
TOINK
TOINK
TOINK
TOINK
UNDESIRED POLLEN CARRIED BY WIND
VARIETY "A"
X
VARIETY "B"
NOW YOU HAVE THE IMPROVED VARIETY WHICH IS BOTH HIGH-YIELDING AND DISEASE RESISTANT.
IMPROVED VARIETY
3
NEXT GROW THE PLANT TO MATURITY AND ALLOW THE SEEDS TO DEVELOP. COLLECT THE SEEDS.
4
PLANT THE SEEDS IN A NUMBER OF PLOTS UNDER CONTROLLED CONDITIONS. REPEAT FOR SEVERAL GENERATIONS FOLLOWING STEPS 2-4. THESE ARE CALLED YIELD TRIALS.
FILIAL GENERATION 1-6
1
2
3
4
5
6
5
FILIAL 1-4 GENERATION (HIGH YIELDER)
X
PARENT VARIETY (DISEASE RESISTANT)
FROM THESE YIELD TRIALS SELECT THE PLANTS SHOWING DESIRED CHARACTERISTICS (I.E. HIGH YIELDING) AND BACK-CROSS OR CROSS AGAIN TO ORIGINAL PARENT VARIETY (DISEASE RESISTANT) TO ACHIEVE HYBRID VIGOR. FOLLOW STEPS 2-4.

(Source: Balai, Asian Journal, No. 7, 1983)

APPENDIXES

Appendix I

FROM GREEN REVOLUTION TO GENE REVOLUTION

Since the beginning of agriculture, nations have struggled to monopolize certain plants of commercial importance. This struggle was most obvious and at its greatest height during the colonial era of the last century. Then, new scientific tools and a network of botanical gardens brought about the transformation of world agriculture. Today, the struggle to monopolize specific genes in the development of agriculture is leading to the development of other scientific tools and institutions: chief among them, the genebank and the International Agricultural Research Centres. Now, as in the last century, scientists are largely pawns in a much larger scheme.

The history of the colonial era is, to an amazing degree, a history of plant transfers: South to North, or from Latin America to Asia, to Africa to Latin America. Like living pawns in the imperial chess game, coffee, tea, cocoa, rubber, bananas, sugarcane, cotton, and spices, were shifted back and forth over the surface of the globe. Although few could have anticipated it at the time, the botanical chess game has had long-term implications for the development and underdevelopment of the Third World that simply cannot be exaggerated.

Perhaps the world's most famous incident of plant smuggling is the removal of wild rubber from Brazil in 1876 by botanists from Britain's Kew Gardens. The precise illegality of the removal is not clear but it is plain that the botanists knew their act would not be welcomed since the exploit was undertaken under cover of darkness and the tale told and retold in England as 'high adventure.' The effect of this theft by Kew, a government agency, is well known. From controlling 95 per cent of world rubber exports, Brazil's share plummeted to 5 per cent. Less well known is the impact of the theft on the recipient estates in Sri Lanka, Singapore, and Malaysia. Seventy five per cent of Britain's Asian rubber production is based upon 22 seedlings that survived the circuitous journey from Brazil to London and then onwards through Sri Lanka. The problems and conflicts associated with this extreme genetic uniformity remain with these countries today.

The plant transfers of the colonial era benefitted the European powers enormously. Huge commercial empires were created from coffee, tea, rubber, etc. While the profits from these new plants fuelled the industrial revolution, many less famous plants also played a major role. Europe's diet improved directly with a host of new food plants such as potatoes and tomatoes and, indirectly, with the introduction of new pasture plants from Africa, and Latin America. The new plants had an impact in the textile industry and in every facet of the fledgling chemicals business ranging from paints, dyes and resins, to medicinal

preparations. A substantial commercial trade also developed around the provision of exotic flora for the gardens and greenhouses of Europe's aristocracy. The pace of plant introductions can always be linked to the spread of political power.

A history of British plant introductions

Period	Introductions
Sixteenth century	84
Seventeenth century	940
Eighteenth century	8,938

Two developments — one scientific, and the other institutional — were essential to the practical exploitation of the Third World's botanical resources in the last century. The first was the invention, in 1829, of the Wardian case which, for the first time, allowed the relatively safe transfer of living plants from one corner of the globe to another. With the aid of the Wardian case, British botanists were able to transfer six times as many plants in 15 years as they had in the preceding century.

The institutional development was the spread of a thin green line of botanical gardens girding the globe from Kew to the Bahamas to Trinidad, to Hawaii and Australia, to Singapore, Calcutta, Colombo, and onward through Africa. From these strategically located institutions, a small band of altruistic scientists went forth and collected, analyzed, forwarded and received the world's flora, both beautiful and beneficial. The great knowledge they gained is available to any scientist today but the profits they made possible have long since accrued to their homelands. Almost as a by-product to their scientific pursuits, they utterly transformed the agricultural economy of the world.

Today's Wardian case may be a gene bank. The technological concern is no longer the safe transfer of living plants but the transfer and safe storage of germplasm essential to the new agricultural revolution offered by genetic engineering. The new thin green line may be composed of the International Agricultural Research Centres (IARCs) of the CGIAR system. This new line stretches from the International Food Policy Research Institute in Washington to the International Maize and Wheat Improvement Centre (CIMMYT) in Mexico to the International Rice Research Institute (IRRI) in the Philippines; from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India and the International Centre for Agricultural Research in Dry Areas (ICARDA) in Syria to the International Centre of Tropical Agriculture (CIAT) in Colombia and the International Potato Centre (CIP) in Peru. Although their crop mandates are often narrow, most are strategically placed in the Vavilov Centres of diversity.

Studies of the IARCs have tended to focus on their impact in the Third World. Very little has been said of their impact on the First World. Like the botanical gardens of the last century, the IARCs of today are making a substantial contribution to the transfer of genetic material to the North.

CIMMYT, for example, supplies the North with improved breeding material through its large nursery trial programme. One hundred and twenty-seven

The IARCs and the gene transfer system

states participated in the trials in 1978 involving a total of 2,226 trials. Test stations are obliged to report back the results of the 'grow out' to CIMMYT but they are welcome to keep the germplasm either for direct use as a variety or for use as a parent line in other varieties. Over a quarter of all the wheat nursery trials take place in the North. There were 17 trials for wheat in countries as far north as Finland, Norway, and Sweden, and another 37 in Canada.

It should be seen that the North contributes barely 1 per cent of all the nursery trials for maize. Given the importance of this crop to such states as America and France, their lack of interest in maize might seem surprising. Yet, at another level, the North's interest is very high. CIMMYT has a problem growing out maize germplasm in its Mexican gene bank. It lacks both the personnel, the time, and the land on which to rejuvenate accessions whose germination rates are declining in the bank. One American company has stepped into the breach and has volunteered to multiply this exotic material at its own Florida research station. That company is Pioneer Hi-Bred — the world's largest maize breeding corporation.

The International Agricultural Research Centres also fulfill an important role in training scientists. In the dozen years from 1966 to 1978, for example, CIMMYT trained 886 future agronomists — virtually all of them from the Third World. Another 840 scientists visited CIMMYT during the same period in programmes that ranged from a week to several months.

No breakdown of the nationality of these researchers is readily available but from our own discussions with agronomists from Finland to Australia, it is common to encounter women and men with practical CIMMYT experience.

The first phase of the Green Revolution taught CIMMYT scientists that it is better to release improved germplasm than finished varieties. Increasingly, they see their role as supporting national breeding programmes. To that end, they identify and circulate material which may have value to any interested party. This is as it should be. But the danger — now being recognized by the IARCs — is that they will be relegated to the role of doing basic research for the benefit of private companies. The companies can take IARC material and exploit it for their own commercial purposes — and on a global scale. Many IARC scientists find this possibility deeply disturbing.

US private sector involvement in government exotic germplasm 'grow outs'

Company	Crops
Agrigenetics	Maize, Sorghum, Soybean, Sunflower
Atlantic Ritchfield	Cotton
Cargill	Barley, Cotton, Maize, Sorghum, Sunflower, Wheat
Chocolate Vayou	Rice
Ciba-Geigy	Maize, Sorghum
Dekalb-Pfizer	Cotton, Maize, Sorghum, Soybean, Sunflower
Del Monte	Beets, Peppers, Spinach, Beans, Peas, Tomatoes
FFR Cooperative	Beans, Maize, Millets, Forage Legumes & Grasses
Gold Kist	Groundnut, Soybean
Heinz	Tomato
Illinois Foundation	Maize, Soybean
ITT	Grasses
Kay	Safflower, Sunflower
Land O'Lakes	Sorghum
NC+Hybrids	Maize, Sorghum
Pioneer Hi-Bred	Maize, Soybean, Wheat
Pure Seed Testing	Grasses
Sandoz	Maize, Pea, Bean
Shell/Olin	Barley, Lucerne, Soybean, Wheat
Stoneville Pedigreed	Cotton
Sturdy Grow	Maize
Southwide	Soybean, Sorghum
Soybean Research	Soybean
Tejon Ranch	Lucerne
Upjohn	Maize, Soybean, Sorghum
George Warner Seeds	Barley, Oats, Rye, Sorghum, Wheat

As valuable as the gift of a new IARC variety may be for exploitation in the North, genetic engineering is shifting the interest from whole plants to specific genes. We have already referred to Pioneer Hi-Bred's role in testing CIMMYT's exotic maize material. This is not a unique situation. Indeed, the US Government now regularly turns over its exotic germplasm for 'grow out' help from American companies. US officials describe the support provided by the companies as a 'generous offer' and even (with some confusion) have said, 'If the US Treasury had notified citizens of a gold shortage, how many would have answered the call with a direct donation?' In fact, the reverse is true. The national Seeds Storage Laboratory at Fort Collins — a genetic Fort Knox — is offering to give its 'gold' to private companies for sampling. The companies have

responded with enthusiasm.

As was the thin green line of yesteryear, the thin green line of today continues to be a conduit of Third World information and resources.

1. For an excellent review of the history and for further details on the examples cited here, read Brockway, Lucile H., *Science and Colonial Expansion: The Role of the British Royal Botanic Gardens*, Academic Press, London, 1979.
2. For a general discussion and data, see Lemmon, Kenneth, *Golden Age of Plant Hunters*, Phoenix House, London, 1968.
3. CIMMYT Review, 1981.
4. Dias, Clarence J., and Ghai, Yash P., 'Plant Breeding and Plant Breeders' Rights in the Third World: Perspectives and Policy Options', IDRC Draft Report, April, 1983, P. 19. We recommend the whole report for reading, however.
5. From *Diversity*, Vol: 1, No. 3, November/December 1982, P. 9.
6. We have grouped individual companies by their actual owners.

*** Excerpts from Pat Roy Mooney, 'The Law of the Seed,' in Development Dialogue, 1983: 1-2, pp. 84-94**

THE GLOBAL SEEDSMEN

The economic importance of plant breeding is being increasingly recognized for a number of reasons — not least the advent of the Green Revolution and of plant breeders' rights.
J T Walker, Royal Dutch/Shell, in *Span* (a Shell publication), 15 March, 1972, p. 123.

At the close of the 1970's, FAO identified 1,782 public and private entities engaged in plant breeding or seed trading. The OECD lists 652 enterprises engaged in the international trade of agricultural seed (as distinct from horticulture or silviculture) in 37 leading countries. Like the grocery store cornucopia, the image is one of vast diversity. Like the groceries, the reality is somewhat different. Since the early seventies, about the time that the opening quote appeared in Shell's in-house publication, well over 500 seed houses have been taken over by large — almost always transnational — companies. Another 300 seed houses appear contractually linked to these larger firms or, in a few cases, are the result of internal expansion by the parent firm. The effect, in the course of a dozen years, has been to utterly transform the seed industry. Where once it was small and family-based, it is now large and highly corporate.

The commercial value of the seed trade is not easily assessed. Early in this decade, its global worth appears to be around US$50 billion — including retail level sales in every sector as well as the nursery trade. Because cereal seed can easily be saved by farmers and used for sowing the next year's crop, only a fraction of this market yields to annual sales. Also, public sector seed sales in some industrialized and most Third World countries continue to restrict the market available to the companies. In sum, the commercial seed market may be closer to an annual sales volume of US$13 billion.

A 13 billion dollar market is not large in the scheme of things — certainly not large for Shell Oil or Ciba-Geigy. Yet the profitability of the trade is substantial. Even in the 1960's, its returns were ranked second only to the pharmaceutical industry. A recent conservative estimate offered in a report for the International Development Research Centre concluded that the trade has an annual profit rate of 19 per cent. Some EEC officials in Brussels have placed the return on investment (within Europe) as high as 45 per cent — an astronomical calculation.

The reasons for immediate action in the seed industry are better summarized by Shell's article in *Span* (1972), on the Green Revolution and PBR. Norman Borlaug — who had just won the Nobel Peace Prize — demonstrated two crucial truths for the seed industry: that it is possible to breed a basic cereal strain that can be adapted over a vast market area and that governments and foreign aid programmes are prepared to finance the introduction of new varieties and even

The global seedsmen

Rank	Private enterprise	Home state	Parent industry	Total sales	Seed sales	Seed firms*		Number of		
				US $ millions		Direct	Indirect	crops	var	states
A	Royal Dutch/Shell	Anglo/Dutch	Petrol	82,291	650	68	3	55	83	76
	Pioneer Hi-Bred	USA	Seed	557	557	27	2	6	55	16
	Sandoz	Switzerland	Chemical	2,946	319	34	—	12	172	13
	Cardo	Sweden	Agro-Ind.	440	285	25	5	18	108	7
	Dekalb-Pfizer	USA	Seed/Chem.	—	187	29	1	8	142	20
	Ciba-Geigy	Switzerland	Chemical	7,061	107	19	7	9	76	14
B	Upjohn	USA	Chemical	1,828	139	10	1	13	52	7
	Cargill	USA	Agro-Ind.	15,000	—	11	—	6	47	5
	Suiker Unie	Netherlands	Agro-Ind.	353	100	15	1	12	72	7
	Svalof	Sweden	Seed	—	—	7	3	16	62	3
	Clays-Luck**	France	Seed	155	155	5	—	—	—	6
	Kleinwanzelbener Saat.	F.R.Germany	Seed	80	80	26	1	14	125	11
	Cebeco-Handelsraad	Netherlands	Agro-Ind.	—	—	7	—	13	85	7
	Florimond-Desprez	France	Seed	—	—	1	4	10	44	3
	Limagrain	France	Seed	130	130	22	—	8	41	8
	UNCAC	France	Agro-Ind.	—	—	6	—	12	32	2
	De Danske Sukkerfabrikker	Denmark	Agro-Ind.	400	—	10	—	6	46	8

* Direct=a subsidiary.
Indirect=a company of which the senior enterprise has a contractual relationship which may or may not include equity interest.
** There are some indications that a significant share of the Clays Luck equity is now in the hands of public and private French corporations.

handle the costs of distribution to peasant farmers. Until Mexi-Pak wheat, the major companies had regarded the seed market as too geospecific to allow them to exercise their special skills in transnational marketing. Suddenly, it seemed possible to invest a modest sum in R and D and still sell an adaptable variety on several continents. At the same time, the previously insurmountable obstacle of successfully selling a new variety to millions of smallholders — a hugely expensive marketing proposition among customers who could not afford to pay — now seemed solved as the World Bank, UNDP, FAO and a host of bilateral aid programmes began to accord a high priority to the distribution of HYV seed. The companies could sell to their own governments or to a Third World government agency and let them bear the burden of distribution. Third World governments were prepared to heavily subsidize prices and also to force peasant farmers to buy new seed by attaching the use of 'improved' varieties to access to agricultural credit and other inputs including irrigation. From being a needful but uneconomic market, the Third World loomed as a vast and highly profitable one.

The potential for PBR became significant again, at the same time as the Green Revolution was being canonized with the Nobel Peace Prize. Until 1971, the concept of granting exclusive monopoly patents for new plant varieties had been confined either to fruits and ornamentals (as in the United States) or to agricultural crops in a handful of western European countries. Then, at the outset of the seventies, the valuable market area for PBR quadrupled with the inclusion of France, Sweden and the United States into the exclusive-monopoly fold. With similar moves afoot from South Africa to New Zealand, Shell and other transnationals could predict that a worldwide regime of PBR would not be long in coming. Plant patents would give them royalties and, far more importantly, allow them to set the conditions of sale for their varieties and thereby to

manipulate the global marketplace.

Petro-chemical companies could see yet another advantage in the seed industry. Many of them are directly engaged in the production of agro-chemicals: fertilizers and pesticides. Many others have an interest in pharmaceuticals. For those interested in pesticides, there was an obvious advantage to adding seeds to their repertoire, since the same advertising and distribution channels were employed. Then, too, the governments that subsidized seeds might also subsidize agro-chemicals for those seeds. Companies linked to pharmaceuticals also tend to market pesticides and their primary interest was with this business opportunity. There was a second opportunity, however, in medicinal plants.

All three areas — seeds, pesticides and pharmaceuticals — have a common ground in intensive research related to genetics and chemicals. With great new markets and patent security on the horizon, it was only natural for chemical concerns to become the world's new seedsmen.

The new seedsmen often have the way paved for them in the Third World through a host of foreign aid and national government support programmes. In Cameroon, for example, USAID has been distributing groundnut and sorghum seed in its 'Project Semencier' since 1976. Development agencies in the Cameroon often distribute seed to farmers on credit and do not look for repayment until after the crop is sold. Germany's GTZ has launched a number of seed multiplication projects including a Sierra Leone rice multiplication scheme intended to provide inproved seed to local farmers and eventually allow that country to market HYV rice to other parts of Africa. In Egypt, the government subsidizes seed prices to the tune of US$2 million while the Kenyan Government both supplies farm credit for seed purchases and subsidizes the work of local seed companies and actively promotes the use of new varieties through the media. Almost all rice seed is imported in Bangladesh as is three-quarters of the country's wheat seed. The government encourages the use of new seed through credit control, advertising, and its own extension service. The Indian Government provides credit for seed production. In China, the government subsidizes the price of new varieties to farmers. New varieties in Malaysia are popularized by state extension services and the seed is distributed at a nominal fee.

Seed information and credit programmes, government initiatives to subsidize national seed multiplication and distribution, etc. are all intended — when equitably administered — for the benefit of peasant farmers. Of themselves, such efforts are beneficial to the cause of food availability. They are also, inevitably, to the benefit of the new seedsmen.

The fate of the cereals market in the Third World is still not finalized. CIMMYT, IRRI, the other IARCs and national breeding programmes undoubtedly have the lion's share of the market. With the marginalization of the IARCs into the position of basic researches for the private sector, however, the transnationals are expected to out-manoeuvre national programmes to take command of this vital sector. Transnationals like Pioneer Hi-Bred, Ciba-Geigy and Shell are already developing strong positions in maize, sorghum and barley.

The South's vegetable seed market is already firmly in multinational hands. Suttons (owned by Cardo), Ohlsens Enke (owned by Svalof), Daehenfeldt of Denmark and Zaadunie of Holland (owned by Sandoz) are major suppliers of

The chemical seedsmen

Company	World rank in pesticides	World rank in pharmaceuticals	Activity in the seed industry
Bayer (D)	1	2	Breeding Prog. at Helena Chem. in USA
Ciba-Geigy (CH)	2	4	Maize, Soya, Sorghum, Cotton with pest.
Shell (NL/GB)	3	—	Barley, Wheat, Maize, Soya, Cotton with pest.
Monsanto (US)	4	—	Hybrid Wheat prog. with growth regulators
Rhone-Poulenc (F)	5	16	Rumoured link to Clays-Luck in France
BASF (D)	7	—	Has sold or is selling seed interests
Eli Lilly (US)	8	11	Active in agricultural genetic engineering
Du Pont (US)	9	—	Active in agricultural genetic engineering
Stauffer (US)	10	—	Maize seed and pesticides in USA
Hoechst (D)	11	1	Has one known British seed company
Dow (US)	12	33	Active in agricultural genetic engineering
Union Carbide (US)	14	—	Has sold seed interests
Rohm & Haas (US)	18	—	Hybrid wheat with sterilizing chemicals
Sandoz (CH)	19	7	Maize, Wheat, Cotton with pesticides
Diamond Shamrock (US)	20	—	Sorghum in Mexico; pesticides
Sumitomo (J)	21	x	Vegetable seed interests; pesticides
Takeda (J)	24	10	Rumoured vegetable/oilseeds seed firms
Pfizer (US)	x	8	Maize, small grains breeding with Dekalb
Upjohn (US)	x	18	Soybean seeds and chemicals; vegetables
Reichold (CDN/USA)	x	—	Turf and garden seeds and chemicals (Florida)
Tenneco (US)	x	—	Albright and Wilson (GB) seeds and pest.
KemaNobel (S)	x	x	Fruit and vegetable seeds & fungicides
Olin (US)	x	—	Maize, Soya, Barley, Wheat, Cotton with pest.
ITT (US)	x	—	Turf, garden seed with pest. & fertilizers
W.R. Grace (US)	x	—	West Indies seeds; fertilizers and pest.
Celanese (US)	x	—	Vegetable seeds and seed coatings
Elf Aquitaine (F)	—	x	Genetic engineering in pharm. and seeds; four French seed houses
Occidental Pet. (US)	x	—	Vegetable seed co.; fertilizers and pest.
Cardo (S)	x	—	Seeds; retail pest.; also sugarbeet coats and genetic engineering
British Petroleum	x	—	Has two Dutch vegetable seed houses—rumours of others
Mitsubishi (J)	x	—	Rumoured vegetable seed interests
Mitsui (J)	x	—	Rumoured vegetable seed interests
Atlantic-Richfield (US)	—	—	Vegetable seed co. in USA
Terra Chem. (US)	x	—	Has one US seed co.

x = active in the field; — = not notably active.

vegetable seed to Africa and western Asia. Japanese breeders like Takii and others which appear to be controlled by Sumitomo and Mitsubishi have a lead position in Southeast Asia. Yates of Australia and its unrelated namesake in New Zealand are also fighting for a share. Vegetable seed for Latin America and the Philippines is marketed by American companies like Dessert Seeds (Atlantic-Richfield) and Ferry-Morse (once held by Purex and now controlled by Limagrain of France).

The important seed potato market in the south seems to be largely in the hands of three Dutch private and cooperative companies: Hettem, ZPC and Agrico. Seed potato exports bring the Netherlands about 300 million guilders a year, of which 100 million guilders is derived from sales in the South.

The range of seed-related activities in the South is growing daily. Hilleshog (a Cardo subsidiary) is working with Swedish Match to breed Acacia Mangium trees for the Philippines. Campbell Soup has joined forces with an American genetic engineering company and Brazilian interests to breed new tomatoes in Brazil. The International Plant Research Institute (a very private company despite its name) has launched a joint venture with Sime Darby Berhad of

OECD variety domination of 13 major crops. Public and private sector domination of the internationally-traded varieties for 13 major crops as identified by the OECD Scheme for the Varietal Certification of Seed Moving in International Trade in 1981.

Crop	No of varieties	Enterprise	Direct percentage	Total percentage
Maize	1038	Public Sector=		8.36
		French Govt.	3.22	
		Private Sector=		91.64
		Dekalb-Pfizer	10.57	
		Sandoz	9.19	
		Ciba-Geigy	6.25	
		Pioneer Hi-Bred	4.96	
		Upjohn	4.30	
		Kleinwanzelbener Saat.	3.68	
		Cargill	3.58	
		Top 7 Private Firms=		42.53
Winter Wheat	412	Public Sector=		35.43
		Italian Govt.	9.89	
		Bulgarian Govt.	5.52	
		UK Govt.	5.29	
		Private Sector=		64.57
		Royal Dutch/Shell	5.06	
		Dekalb-Pfizer	3.22	
		Cebeco-Handelsraas	3.22	
		Florimond-Desprez	2.99	
		Cardo	2.30	
		Top 5 Private Firms=		16.79
Sugar-beet	326	Public Sector=		4.90
		Romanian Govt.	2.15	
		Private Sector=		95.10
		Suiker Unie	11.96	
		Great Western	10.43	
		Cardo	9.20	
		Kleinwanzelbener Saat.	9.20	
		SES	6.75	
		Top 5 Private Firms=		47.54
Spring Barley (2 row)	217	Public Sector=		19.35
		UK Govt.	5.07	
		Canadian Govt.	3.23	
		Private Sector=		80.65
		Royal Dutch/Shell	9.68	
		Cardo	9.22	
		Cebeco-Handelsraad	5.99	
		Svalof	5.22	
		UNCAC	3.23	
		Top 5 Private Firms=		33.34
Lucerne (Alfalfa)	173	Public Sector=		84.33
		Italian Govt.	14.37	
		US Govt.	12.07	
		Canadian Govt.	5.75	
		Australian Govt.	4.02	
		Private Sector=		15.67
		Sandoz	4.02	
		De Danske Sukker-fabrikker	4.02	
		Top 2 Private Firms=		8.04
Spring Wheat	152	Public Sector=		44.07
		Kenyan Govt.	15.13	
		Canadian Govt.	10.53	
		Australian Govt.	5.26	
		Private Sector=		55.93
		Sandoz	7.89	
		Cardo	6.58	
		Cebeco-Handelsraad	3.95	
		Royal Dutch/Shell	1.97	
		Ciba-Geigy	1.97	
		Dekalb-Pfizer	1.97	
		UNCAC	1.97	
		Top 7 Private Firms=		26.30
Spring Oats	128	Public Sector=		47.65
		Canadian Govt.	22.66	
		UK Govt.	7.81	
		Private Sector=		52.35
		Svalof	7.03	
		Cardo	3.91	
		Kleinwanzelbener Saat.	3.13	
		UNCAC	3.13	
		Dekalb-Pfizer	2.34	
		Cebeco-Handelsraad	2.34	
		Top 6 Private Firms=		21.88
Durum Wheat	107	Public Sector=		52.33
		Italian Govt.	30.84	
		Canadian Govt.	4.67	
		Private Sector=		47.67
		Sandoz	1.87	
		Dekalb-Pfizer	1.87	
		UNCAC	1.87	
		Top 3 Private Firms=		5.61
Field Pea	99	Public Sector=		33.33
		Hungarian Govt.	7.14	
		German Dem. Rep. Govt.	5.10	
		Private Sector=		66.67
		Cebeco-Handelsraad	10.20	
		Svalöf	6.12	
		Cardo	3.06	
		Top 3 Private Firms=		19.38
Timothy (pratense L.)	97	Public Sector=		35.05
		Canadian Govt.	6.93	
		Polish Govt.	5.94	
		Private Sector=		64.95
		Suiker Unie	9.90	
		Cebeco-Handelsraad	7.92	
		Svalöf	2.97	
		Top 3 Private Firms=		20.73
Winter Barley (4-6 row)	84	Public Sector=		19.04
		Private Sector=		80.96
		Florimond-Desprez	8.33	
		Kleinwanzelbener Saat.	8.33	
		UNCAC	3.57	
		Royal Dutch/Shell	2.38	
		Top 4 Private Firms=		22.61
Sun-flower	71	Public Sector=		
		French Govt.	14.08	
		Romanian Govt.	12.68	
		Private Sector=		53.53
		Sandoz	21.13	
		Cargill	5.63	
		Top 2 Private Firms=		26.76
Soy-bean	63	Public Sector=		19.04
		Canadian Govt.	7.94	
		Private Sector=		80.96
		Sandoz	31.75	
		Kleinwanzelbener Saat.	9.52	
		Dekalb-Pfizer	4.76	
		De Danske Sukker-fabrikker	4.76	
		Top 4 Private Firms=		50.79

Malaysia (Asian Biotechnology) to breed new crop plants for that region. Among the many vegetable varieties growing this year in both Kenya and Canada are cabbages from Ohlsens of Denmark (again, a subsidiary of Svalof of Sweden); cauliflower and carrots from Dutch and American subsidiaries of the Swiss pharmaceutical house Sandoz; lettuce from Atlantic-Ritchfield's seed subsidiary; cucumbers from the US offspring of a French cooperative; still more carrots from the British seed house of a Swedish corporation; and a sprinkling of beans and melons from various Italian and French concerns.

Excerpts from Pat Roy Mooney, "The Law of the Seed," in Development dialogue, 1983: 1-2, pp. 95-110.

MODERNISING HUNGER

Shouldn't Production Be The Priority?

Question: The Third World countries clearly lag far behind in food production. Only four decades ago the average grain yields in both the industrial countries and the underdeveloped countries were about the same. Now the grain yields in the industrial countries are more than double those of the underdeveloped countries.

By 1985 it is estimated that the underdeveloped countries will fall short of the food they require by 85 million tons annually. Don't all other questions fade before the most urgent one of how to produce more food?

Response: Who wouldn't agree? If people are hungry, everyone assumes there must not be enough food. Indeed, for at least thirty years the central question of every War on Hunger has been: How can more food be produced? We learn of supposed answers almost daily in what we call the "new release" approach to hunger, one new breakthrough after another — protein from petroleum, harvests of kelp, extracts from alfalfa — all to expand the food supply.

In the view of many, the production approach is working. Today more food is, in fact, being produced. The "Green Revolution" now adds an estimated 20 million tons annually to the grain larders of Asia (not including China). In Mexico wheat yields tripled in only two decades.

Yet in country after country where a narrow production focus has resulted in more food than ever before there are also more hungry people than ever before.

We can draw two alternative conclusions:
Either the production focus was correct but soaring numbers of people simply overran even the dramatic production grains;
or diagnosis was incorrect. Scarcity is not the cause of hunger. A production increase, no matter how great, can never in itself solve the problem.

The simple facts of world food production make clear that the overpopulation-scarcity diagnosis is, in fact, incorrect. Present world grain production alone could provide every person on earth with more than 3,000 calories a day. Even more to the point, between 1952 and 1972, 86 per cent of the total population living in underdeveloped countries lived where food production kept pace with or exceeded the rate of production growth.

Indeed, as ironic as it may sound, the narrow focus on increasing production has actually compounded the problem of hunger. Because this startling conclusion goes against the popular wisdom, we have found ourselves wanting to verify and re-verify it in country after country.

Most useful to us in understanding just why and how a narrow focus on production undercuts the welfare of the poor majority has been to examine the Mexican origins of the Green Revolution, the most highly publicised attempt to increase production. Before we began our research we assumed that the Green

Revolution (the campaign to breed "miracle seeds" and to provide the "ideal conditions" — the fertilizers, irrigation, insect-and-weed killers they depend on) was introduced into countries like Mexico in order to bring new hope to people trapped by backward stagnating agricultures. We found we were wrong.

Agrarian Reconstruction under Lazaro Cardenas

In 1910, 2 per cent of the Mexican population owned 97 per cent of the land while in most states 95 per cent of the rural population had no land at all. During the bloody revolutionary wars between 1910 and 1917, well over one million peasants died fighting for land. But for seventeen years the country's peasant majority saw less than revolutionary changes. Then, in 1934, Lazaro Cardenas, a rural-born general in the revolutionary army, was elected president. His administration immediately enacted the country's most sweeping agrarian reform law. For the first time much of the country's better land was appropriated for distribution to the landless, some to be farmed individually and some cooperatively. By 1940, near the end of Cardenas's term, 42 per cent of the entire agricultural population benefited from the distribution of over 78 million acres. Together these small farmers owned 47 per cent of all farmland and produced an impressive 52 per cent of the value of the nation's farm output.

One reason for such productivity was that a newly created national bank channelled credit and technical assistance specifically to the now numerous land-reform beneficiaries. The provision of peasant-oriented services — literacy programs, health services, farm-relevant schooling, and modest rural communications — injected new life into the countryside. Often the results were immediate. In the Laguna area, to cite but one example, the real income of land-reform beneficiaries quadrupled between 1935 and 1938.

The Cardenas administration also invested in scientific research. The purpose, however, was not to "modernize" agriculture in imitation of United States agriculture but to improve on traditional farming methods. Researchers began to develop improved varieties of wheat and especially corn, the main staple of the rural population, always concentrating on what could be utilized by small farmers who had little money and less than ideal farm conditions.

Social and economic progress was being achieved not through dependence on foreign expertise or costly imported agricultural inputs but rather with the abundant, underutilized resources of local peasants. While production increases were seen as important, the goal was to achieve them through helping every peasant to be productive, for only then would the rural majority benefit from the production increases. Freed from the fear of landlords, bosses, and moneylenders, peasants were motivated to produce, knowing that at last they would benefit from their own labor. Power was perceptibly shifting to agrarian reform organizations controlled by those who worked the fields.

The Green Revolution as Counter Revolution: Agriculture to Serve Industrialists

Not surprisingly, by the end of his administration in 1940, Cardenas had made powerful enemies. First were those who had seen their haciendas expropriated. Next were the urban-based monied groups, alarmed by the Cardenas model of co-operative ownership of land and public ownership of certain industries. Instead of investing in rural services and collective enterprises, they wanted the state to pay for electric power, highways, dams, airports, telecommunications, and urban services that would serve privately owned, commercial agriculture and urban industrialization — from which they would profit.

Not the least of the enemies of Cardenas was the United States foreign policy establishment. Land re-distribution with co-operative ownership, as well as Cardenas's nationalization of the Rockefeller Standard Oil subsidiary and foreign-owned railroads, caused "concern" in Washington and on Wall Street. United States corporate investment dropped by about 40 per cent between the mid-thirties and the early 1940s.

By 1942, these enemies of Cardenas's rural reconstruction succeeded in seizing the balance of power within the administration of Cardenas s successor Avila Camacho. The significance of this shift for the future of Mexican agriculture was immediately clear. President Avila Camacho's first agricultural plan stated that agriculture was now to serve as the basis for the "founding of Industrial greatness." Agricultural progress was no longer to be measured first and foremost in terms of the well-being of the rural majority but in how well it served growth elsewhere in the economy.

The United States only reinforced this fundamental shift. United States policy makers identified American interest with the stability of the Avila Camacho administration, with Mexico s ability to produce manufactured goods to support the war effort, and with private control over resources. Getting more food out of the rural areas and into the cities was seen as critical. More food in the urban areas meant lower food prices, an essential ingredient for quieting urban unrest and keeping industrial wages low. Low wages would ensure industrial profits high enough to attract investors, both local and foreign.

It was in this historical context that the Green Revolution was born. The Avila Camacho administration welcomed the Rockefeller Foundation to Mexico, and in 1943 the Foundation joined with the new administration to initiate an agricultural research program. The result on one level was in the much-heralded technical package later to be publicized as the Green Revolution. On another

level, it served to reserve the entire thrust of the Cardenas rural reconstruction.

The field director of the Rockefeller Foundation in Mexico became head of a new office within the Mexican Ministry of Agriculture. His job was to oversee a technical revolution in Mexican agriculture. Policy choices systematically discarded research alternatives oriented toward the non-irrigated, subsistence sector of Mexican agriculture. Instead, all effort went to the development of a capital-intensive technology applicable only to the relatively best-endowed areas or those that could be created by massive irrigation projects. The focus was on how to make seeds, not people, more productive. Agricultural modernization came to substitute for rural development.

Rapid urban-centered industrialization, so profitable for a few, simply could not coexist with the type of rural development promoted by the Cardenas administration. First, true rural development based on making each rural family productive and better-off would have meant that the rural majority itself would have eaten much of the increment in food production. This increment was exactly what the ascendant urban interests counted on taking out of the countryside to feed an industrial workforce. Second, genuine improvement in rural life would have sharply diminished the steady exodus to the towns and cities. But it was just this ongoing influx of rural refugees that was so "needed" to perpertuate low industrial wages.

Thus, only one type of agricultural policy would serve the ends of the urban and industrial interest — one that willfully neglected the problem of the land-reform communities created by Cardenas while lavishing public funds on increasing the production of a few large commercial growers, marketing outside the rural areas. In the words of a United Nations study:

> The burden of transforming the frontier of Sonora into a vast agricultural emporium was... borne to a great extent by the federal treasury; but most of the fruits of the efforts remained firmly under the control of the private landowning elite....
>
> The Mexican government subsidized imports of agricultural machinery. In addition, between 1941 and 1952, 18 per cent of Mexico's federal budget and 92 per cent of its agricultural budget was spent on large irrigation projects to create vast new stretches of rich farmland in the north. This valuable land was then sold at low prices, not primarily to the landless poor, but to politically powerful families of businessmen and bureaucrats. Although by law no one in Mexico can own more than 250 irrigated acres, today the average farm in the Mexican Green Revolution area of Hermosillo has grown to 2000 irrigated acres with some holdings running much larger. Not surprisingly, about 3 per cent of all farms accounted for 80 per cent of the production increase during the 1950s.
>
> Hence we have the model of agricultural development that has been actively exported to virtually all the underdeveloped countries within the sphere of influence of the United States. •

Betting on a Winner

Ignoring overwhelming evidence from around the world that small, carefully farmed plots are more productive per acre than large estates and use fewer costly inputs, governments, international lending agencies and foreign

assistance programs have invariably passed over small farmers (not to mention the landless). The French agronomist Rene Dumont describes a Ford Foundation mission of thirteen North American agronomists to India in 1959. The mission argued that it was practically impossible to make simultaneously headway in all of India's 550,000 villages. So they advised subsidization of technical inputs in those areas that were well irrigated — thereby leaving over half of the nation's farms totally out of the national agricultural development program. It appeared easier to help a small number of large farmers increase wheat production by 50 per cent within just a few years than to mobilize the productive potential of 50 to 60 million farm families. Thus in the mid-sixties, India's New Agricultural Strategy to promote the improved seed varieties ended up concentrating on merely one-tenth of the cultivable land and to a great extent on only one crop, wheat.

Everywhere the large farmer has been directly favoured. A study of Gapan, Nueva Ecija, in the Philippines, in 1966, showed that the first seed produced by the Rockefeller-funded International Rice Research Institute were distributed only to landholders owning 25 acres of rice paddy or more. No seeds were sold directly to sharecroppers or tenants.

The Tunisian agriculture program provided credit only to those owning a certain minimum acreage — usually 125 acres, a largeholding indeed in that country. Moreover, subsidies to dairy farmers went only to those producing more than 525 quarts of milk a day. Subsidies for purchasing combine harvesters benefited only the largeholder, the only one in a position to even consider such a purchase.

Once selected as the focus of government help, the large farmers have taken full advantage of their head start. Frequently the wealthiest landowning families have reaped additional profits by monopolizing distribution of fertilizers, pesticides, and machinery needed to make the new seeds respond. Associations of large commercial farmers like those in Mexico have been able to make considerable extra earnings by exporting the Green Revolution, selling thousands of tons of the new seeds annually to Asia and Africa.

Focusing narrowly on production totals transforms rural development into a technical problem — one of getting the "right," usually foreign-made, inputs to the "progressive," invariably well-placed farmers. We refer to this production focus as narrow precisely because it ignores the social reality of hunger — that the hungry are those with control over little or no food-producing resources. Until control over productive resources is democratized such "agricultural modernization" will remain but a mirage of rural development — a mirage that undermines the interests of the majority of the rural population in order to serve those of a few — large landholders, moneylenders, industrialists, bureaucrats, and foreign investors.

The influx of public funds for the purpose of increasing production has turned into a place for profiteering and speculative investment. But to take part, one has needed some combination of land, money, access to credit, and political influence. That alone has eliminated most of the world's rural majority.

From Food First by Francis Moore Lappe & Joseph Collins, Ballantine Books, New York, 1979, pp. 121-128.

SEEDS AND THE NEW TECHNOLOGY IN ASIA

by

— Baljit Malik and Anna Lloyd —

A series of recent reports for Alternative News and Features from India, Bangladesh, Thailand, Malaysia and the Philippines highlight a dangerous threat to Asian agriculture. The new high-yielding fertiliser-responsive varieties of rice, wheat, coconut and other crops are causing widespread genetic erosion. Another series of reports for ICDA from Europe, the U.S.A. and Canada point to the grave implications for Third World countries of attempts to extend legislation granting patent rights to plant breeders. Gradually, almost imperceptibly, control over the breeding, production and marketing of seeds is being taken over by the oil and agro-chemical transnational companies. Based in the U.S. and Western Europe, these conglomerates are making a bid to move into the growing agribusiness market to be found in Third World countries. By controlling fertilisers and pesticides in addition to the "new seeds", multinationals can exercise control over the entire food system. Royal Dutch Shell already controls more than 30 seed companies in Europe, and four firms — Dekalb, Pioneer, Sandoz and Ciba-Geigy — control two-thirds of the hybrid maize and sorghum market in the United States.

Many shortcomings of the Green Revolution are now widely recognised; the most well known of which is the paradox that an increase in food production has not been matched by an increase in per-capita food consumption. The other serious consequences of introducing the new high yielding crop varieties, are less well-known, the most dangerous being the genetic erosion that is taking place in industrialized as well as developing countries. Genetic diversity is an essential part of a secure and stable food system and it is this very stability that is threatened by the indiscriminate introduction of new hybrid and fertiliser responsive varieties which are rarely suitable for cultivation in local conditions. But for relatively prosperous farmers, the new varieties can be an attractive proposition. Their yields can be dramatically high, and though they consume large quantities of energy, government subsidies usually ensure a high profit margin.

Most Asian countries have committed themselves to the use of HYVs. It is a decision which amounts to the introduction of a food production system designed for temperate life zones, into the tropical and sub-tropical life zones of Asia. Spreading the HYVs encourages monoculture in the agriculture system. Monoculture can perhaps work with less detrimental effects in a temperate climate where there are fewer species of plants. But the stakes are far higher in tropical areas, which have an intricate plant and climatic ecology. In Asia, luxuriant plant growth co-exists with a harsh physical environment marked by ex-

tremes of drought, floods and low soil fertility. These conditions have produced crop varieties with an extraordinary ability to survive. Many traditional varieties of seeds have been known to produce crops in conditions where the HYVs have completely failed. But now these very varieties are threatened with extinction by the new fertiliser-hungry seeds.

In India 100,000 tons of certified wheat seed were earmarked for production for the 1977-78 winter (rabi) crop season. Out of this, just one variety, Sonalika took up 65,000 tons and another, Kalyanasona, 20,000 tons. Both these varieties have a narrow genetic base and crop losses of up to 2½ million tons per season have been reported. It is interesting to set this figure against the Indian government's decision to import 3 million tons of wheat from the U.S.A. over the next two years. It is rather disturbing that there is virtually no effort at an official level to produce certified seeds of traditional varieties even though large tracts of land are still not covered by the HYVs.

According to a report from the Philippines, a national coconut replanting programme is now in progress which plans to replant all 2.9 million hectares of Philippine coconut farms by the year 2020. The variety which has been chosen is an HYV called Mawa, also known as Port Bouet 121 or the 'Ivory Coast' variety. The replanting programme has been criticised on the grounds that the planting of one homogeneous variety could lead to the entire coconut crop being wiped out should the variety fall prey to disease or pests.

The new seeds certainly produce more food in priority areas with a highly developed infrastructure, but the necessary irrigation facilities, the credit and marketing networks and subsidies for inputs are precisely the facilities that are grossly lacking in developing countries. The financial resources required to invest in such an infrastructure are simply not available.

Despite HYVs being unsuitable for resource-poor farmers, who form the majority of cultivators in developing countries, the illusion exists that the cultivation of HYVs leads to self-reliance and self-sufficiency. The Indian example is a telling one. While it is true that the country has partly overcome the need to import food grains, the import level of nitrogenous fertilisers increased from 235 thousand tonnes in 1964-65 to 1,228 thousand tonnes in 1978-79. Indian plant breeders are fully aware that in the long-run, the western model of food production is far beyond the means of the national economy. Attempts are being made to replace industrial nitrogen with economy-saving nitrogen fixation techniques. But political pressures from farmer lobbies in high production areas, from the growing fertilizer industry, and from the powerful plant breeders and bureaucrats who initiated the Green Revolution, prevent an overall change in strategy.

Agriculture in the Philippines also creates the same illusion of self-sufficiency. Although the rice fields have lost thousands of native varieties, there are increased stocks of rice available for consumption through the public and private distribution system. But to produce HYV rice, the country had to increase its fertiliser imports from 101.2 million tonnes in 1956 to 563 million tonnes in 1973, at a time when there was a four-fold increase in the world price for fertilisers.

Even though the Green Revolution in Asia has taken a dangerous path, it may

still not be too late to change course. Unless governments take a serious view of the economic and ecological disadvantages of the HYVs, Asian countries could be faced with the ironic situation of 'surplus' food and massive hunger. Even more unethical than the grain and butter mountains of Europe and North America would be similar accumulations of food stocks within the Third World. In aggregate terms per-capita food intake may even go up, reflecting more food consumption by the middle and upper classes while the rural and urban poor remain as ill-fed as ever.

Alternative News & Features (from the International Symposium on World Food Security and Plant Genetic Erosion, organised by the International Coalition for Development Action, 1981).

SEEDS OF DISCONTENT

Lawrence D. Hills

Director of the Henry Dounbleday Research Association

The Third World Seed Problem

In terms of the world's genetic heritage, the loss of vegetable varieties in Europe, America and Australia is of minor importance compared with the destruction of those in the Third World. At least 500 major vegetable *species* were grown by the ancient civilisations of the world, which has dwindled to 200, of which only 80 are grown commercially. The Western World relies on only 30 species for 94 per cent of our vegetable nutrition.

In Sri Lanka they grow 40 species of root (compared with only twelve in Britain today) and 28 species of leaf vegetables. There are 22 provinces in Sri Lanka and three climate zones, ranging from steamy tropics at sea level (where "The Bridge on the River Kwai" was filmed), through sub-tropical, up to the temperate highlands where the tea plantations are. All grow roughly the same vegetables with varieties to suit each zone and district.

Company-produced seeds are bred to pure lines, as alike as identical twins. What can be termed 'unexploited seeds' from Third World Countries (Sri Lanka is horticulturally a First World country because they have been gardening for about a thousand years longer than Britain) are more like football teams with full backs for cold years, centre forwards for dry ones, and goalkeepers to resist pests and diseases. Their individual talents are blended to produce a crop for all seasons. Each variety has over the centuries become suited to the conditions of its zone or district, and no pest or disease can sweep suddenly through it as southern corn leaf blight did in the U.S.A. in 1970 or downy mildew in pearly millet in India in 1971.

Now, these varieties are rarely "uniform, stable and distinct". If any Third World country adopted the U.P.O.V. plant patent system, *all* the local varieties would become illegal. Each one is a gene pool in itself, a centre of genetic diversity which is an unexplored as the botanic treasures of the Amazon. There is undoubtedly scope for selection and breeding from these collections of vegetables, but it is as essential to keep a reserve of the original race growing under the original conditions, as it is to preserve the wet lands of Europe where the rare birds and bog plants grow.

The Limitations of Gene Banks

When an unexploited vegetable variety (which could be called a 'U.V.V.' for short, a term to include variable species since, as Darwin established, species are not fixed but collections of variations) is stored in a gene bank there is a random selection of those variations which will not take twenty years freezing.

Then when grown, such varieties provide variations that suit the conditions near the gene bank. As an example, a rice variety from Sri Lanka sent to a gene bank in the Phillipines may well lose its 'goal-keeper' from the balanced team that suits the country it came from, and as it is grown on repeatedly through the years, the mixture would be further and further from what was originally stored.

This problem does not arise with pure lines or the inbred parents of F.l hybrids, only with mixtures. The only European examples are the broccoli strains grown by the Cornish and Brittany farmers who expect to start cutting a field in October and keep on till March, with all sizes available, and as much disease resistance as possible. The National Vegetable Research Station at Wellesbourne bred a modern version, but had it banned by the E.E.C. regulations. The only way the growers can get this is by employing a retired seed expert to grow their seed, as stated earlier. So far the quantity involved has not stirred Authority to action.

Third World Vegetable Sanctuaries

The Henry Doubleday Research Association, with the co-operation of the Sri Lanka Rural Organisation, which is a peasants co-operative working to create labour intensive industries that consume the minimum imports and with the support of Christian Aid, which has made a grant of £1,000 a year for three years, has started the world's first Third World vegetable sanctuary. A member, Dhanapala Samarasekara, has provided a site of about five acres, which will be rice paddies, growing at first three out of sixteen traditional mixture rice varieties that are now being driven from cultivation by the 'Green Revolution Grains.'

These better varieties need quantities of chemical fertilisers and pesticides which exterminate the eight species of sprat-like fish that live in the flooded paddies and provide a major part of the protein in the local diet. There are no Fish Fingers in Sri Lanka, just catch-it-yourself fish, like pick-it-yourself strawberries. The traditional rice varieties produce two crops a year with the second one sown in a seed bed before the first is harvested, and transplanted into the vacant paddy. The old kinds lasted about a year, but the modern hybrids last only six months, so fresh seed has to be bought from the big companies for every sowing. In Britain those who do not buy Spanish or Louisiana organically grown rice, are now finding a sudden tastelessness in what they buy from ordinary shops — the high carbohydrate, low protein Green Revolution varieties are being exported to earn better prices from British housewives rather than from citizens of hungrier countries.

An important part of the idea of Third World vegetable sanctuaries is the concept of the 'Farmer Curator'. There are no stately homes with walled kitchen gardens in Sri Lanka, India or Bangladesh and the man in charge must be an experienced farmer or gardener who knows the traditional methods and can pass them on to students before his knowledge dies with him.

The Sri Lanka sanctuary has Mr. Illesinghe, President of the Sri Lanka Rural Organisation and the retired headmaster of a school famous for its farm course and its horticultural section. Since his retirement he has been cultivating rice. He would require an honorarium and travelling expenses, for the rice paddies are seven miles from a further five acres of vegetable growing land. He will earn

£15 a month, plus £100 a year travelling expenses, with a part-time typist at £10 a month, two full-time farmworkers at £15 a month, and the balance of the £1,000 would pay general running expenses. These wages are in line with local rates, and explain why volunteers from the West are too expensive, unless they have special skills.

The £1,000 a year should produce in the course of three years:-

1) An accurate estimate of the social, environmental and economic gains and losses from growing traditional rice varieties rather than modern, high yielding, hybrids.
2) A record of the traditional ecology of rice paddies in Sri Lanka, including the replacement of tractors by water buffaloes since recent oil price rises.
3) Facilities for the study of this ecology and the traditional rice varieties by scientists from other countries.
4) The preservation of the traditional races of rice and their supply, both as grain and seed for distribution experimentally or commercially.

Three years is not long and this enterprise is starting on the barest minimum of funds, but it has a chance in that time of becoming self supporting. For while the West gladly invests in nuclear power stations and mighty dams, something that merely provides jobs for hard working intelligent brown people is apparently less attractive to fund.

Rice is both wind and bee pollinated, but if the varieties on a single site are restricted to these, cross pollination can be avoided by staggering the sowing dates. It would be possible with sufficient funds to run a complete collection of all sixteen varieties, widely separated and also apart from the Green Revolution varieties to avoid crossing with these.

The rice varieties are chosen because they are in the greatest danger and because it is possible that the whole enterprise could become self supporting.

Mr. Samarasekara has a journalist friend who will prepare a small booklet on the rices of Sri Lanka, and when we have a set of varieties available, samples from the sanctuary could be packeted on tea packeting machinery for sale in health-food shops as a trial. As a start the Wholefood Shop in London's Baker Street is co-operating. No Sri Lankan buys just 'rice', any more than we ask for just 'meat' in a butcher's shop. It is likely that several of these rices will suit Western tastes, and these could be grown on contract by local farmers if we built up an export trade in high protein rices, organically grown, for the wholefood trade.

The vegetable collection would also need to be scattered like those of seed guardians in Britain, so that each area would grow varieties of different natural orders, or with different chromosome numbers, that like onions and leeks, would not cross. These varieties would not only need to be grown as traditional mixtures, but selected and bred, to see whether the application of modern plant breeding techniques would be valuable in terms of yield and other qualities.

Towards an Answer to the Seed Problem

An author's or musician's royalties end fifty years after his death, so do those of all inventors. There comes a time when every invention becomes part of the

common stock of humanity or enter public domain. The whole world is not still paying royalties on the wheel to India.

The outcry against plant patents is not against the right of the plant breeder to enjoy a reward on his skill and his investment. It is against the demand made by his organisations to enjoy rights that no other patent holder or creative artist has ever claimed. No play-wright has ever insisted on making it impossibly costly and difficult to print or perform Shakespeare or Euripedes. You can patent a Model T. Ford, but no-one can stop you making an exact replica and selling it. Unfortunately, you cannot breed good automobiles or tractors.

We need a two-tier system of plant varieties. The top tier would be those which are bred today and patented as they now are, with royalties to reward the breeder, or rather his employers. The lower level would be 'Historic', with a ruling that any variety older than fifty years should be outside the existing regulations to be bought or sold freely in any country. They would be part of the common heritage of humanity, like the wheel, the arch, the lever and Beethoven's Ninth Symphony.

A 5 — point plan:

1) This simple way round would allow small seeds-men sell 'H' seeds (like Caruso records) to those who appreciated their qualities and did not expect them to have been checked, and inspected and up-to-date.
2) The peasants of Europe would be able to continue raising their own local varieties and selling the surplus, without deciding which peasant should pay £240 (or the local equivalent) to become the registered maintainer of a variety grown in his district for a thousand years.
3) This would exempt all the Third World 'varieties' from extinction if the countries they grow in wish to accept plant patents in order to buy new and patented hybrids.
4) Make it possible for vegetable sanctuaries, to sell seeds, and restore to gardeners the right to buy what they wish to grow in their own gardens. In no other field is the consumers choice limited by law to what it pays a trade to sell.
5) This would allow Third World sanctuaries the right to trade freely in the most historic seeds of all — the traditional unexploited seeds that deserve research on their qualities of hardiness and disease resistance, to be undertaken in other Third World countries.

The main objection to this simple and practical solution is that there are at least a hundred varieties of vegetable in Britain alone, including Pilot, an early pea grown since 1904, James intermediate carrots, 1885 Snows Winter white cauliflower 1900, and all the year round lettuces, 1895. These would not be maintained to the standard of the Ministry. The answer is that all would be a cheaper quality seed, and those who bought them would have to depend on the craftsmanship, honesty and reputation of the firm that sold it, as customers always have.

The other objection is that no-one wants to grow the out-classed varieties from the past when they can buy the latest modern hybrids until these are replaced by still later varieties, more finely tuned to the current state of the market.

That is where the vegetable sanctuaries of all countries come in, to preserve our genetic heritage, especially in the Third World, where it could be done at minimum costs compared with that of building hotels to accommodate those who come to photograph wildlife in a National Park. It is not patents that matter but people — willing, hard working, skilled and hungry. Saving the vegetable seeds of all the world would cost relatively little, in an age of aircraft, space and nuclear power and weapons that could cost us the Earth.

Lawrence D. Hills, 'Seeds of Discontent' in Ecologists, Vol. 12, No. 6, 1982

AN OPEN LETTER

by

Upendra Baxi

and

Clarence Dias

First, there is need for communicating the available information to the people in their language and idiom. People rooted to soil and living on land will have little difficulty in relating the linkages between PGR and their own plight.

Second, out of a dialogue with the people may arise possibilities of action at the national, regional and international levels.

At the **international** level, you may think of indicating your solidarity with the governments and leadership of the South by supporting the Mexican Resolution 6/81, acknowledging the principle that PGR constitute a common heritage of mankind and to redeem it from corporate plunder and vandalism the establishment of an international Gene Bank under the FAO auspices is imperative. You may wish to write acordingly to:

(i) Secretary General, The United Nations; New York, U.S.A.
(ii) The Director-General, FAO, Rome;
(iii) Your own Government.

At the **regional** level, you may wish to communicate your action, both at the national and international level, to kindred NGOs and NGIs. You may, in your activities of regional collaboration, wish to include discussions on "What is to be done?" in the context of the PGR.

At the **national** level, the task is the most challenging and complex. You might consider any or all of the following measures:

(i) demand an integrated forest, ecology and energy policy;
(ii) create a demand for an appropriate seed technology (AST), as explained below;
(iii) campaign for conservation of germplasm as a national heritage and for legal and policy constraints on germplasm collections by or under the auspices of multinationals;
(iv) campaign for high priority dedication of adequate resources for National Gene Bank under public sector management;
(v) campaign for a periodic white paper from the governments as to the state of PGR in your country;
(vi) demand an effective regulation of plant breeding activities in the private sector.

What would be an AST? Technically, this would at least mean development of plant varieties with vigour — that is, adverse soil tolerance, drought tolerance.

deep water and flood tolerance, disease and insect resistance. There is also need to develop perennial or apomictic hybrids.

The AST will need to strike a balance among the following competing needs:

— the needs of farmers to grow a safe crop at low cost;
— the needs of consumers to have adequate and continuous supplies at a reasonable price;
— The need to secure greater profitablility to farmer producer than the multinationals.

Perhaps, the most significant aspects of seed technology choices in the Third World relate to distribution, income and nutrition effects of the technology. If reaching and helping the smaller farmers and rural poor is an objective, seed technologies can, and should, be biased to **disproportionately benefit the rural poor.** Hard policy choices needed to achieve this may involve:

(i) preference for stable over unstable seed. Poorer farmers find it difficult enough to obtain seed. If they once obtain a stable seed, they can replant from their own resources, year to year, without loss of yield;
(ii) higher-yielding varieties of the food crops grown and eaten by the poorer sections of the community (e.g. millets) can be expected to benefit them disproportionately. Thus the choice of crop to which to devote seed-breeding expertise may itself benefit, to a greater or lesser extent, the poorer rural communities;
(iii) preference for varieties with high yields of calories under conditions of low fertility will favour the poorer farmers who have more difficulty obtaining fertilizers;
(iv) water-stress tolerance will benefit those less well-endowed farmers whose fields are likely to be short of water;
(v) storage for long duration, susceptibility to wetness;
(vi) short-duration varieties may disproportionately benefit farmers who are unable to plant on schedule because of inability to obtain inputs;
(vii) varieties with a high return to labour-intensity may favour poorer farmers who can rely on their family labour with negligible opportunity;
(viii) varieties which will fit into existing promoting an integrated farming system, traditional farming systems and existing or anticipated farm labour demand profiles will tend to benefit the poorer, smaller men who are unable or less able than their better-off neighbours to attract or pay casual labour;
(ix) varieties which can be inter-planted with other crops to reduce risk and increase calorie yields (and perhaps nitrogen fixation) may benefit those with very small plots of land;
(x) varieties which are independent of mechanical requirements will reduce dependence on those who monopolize tractors or other machines.

AST will also combat privatization. In other words, plant breeding must be preeminently in the public sector. The NGOs and NGIs may, at the same time, wish to remind themselves that often the public sector remains as non-accountable, in net effect, to the people as the private sector. You might want to suggest to your governments and legislatures ways and means to increase accountability of the public sector in the plant breeding domain within the

framework fo the proclaimed national objectives of the AST.

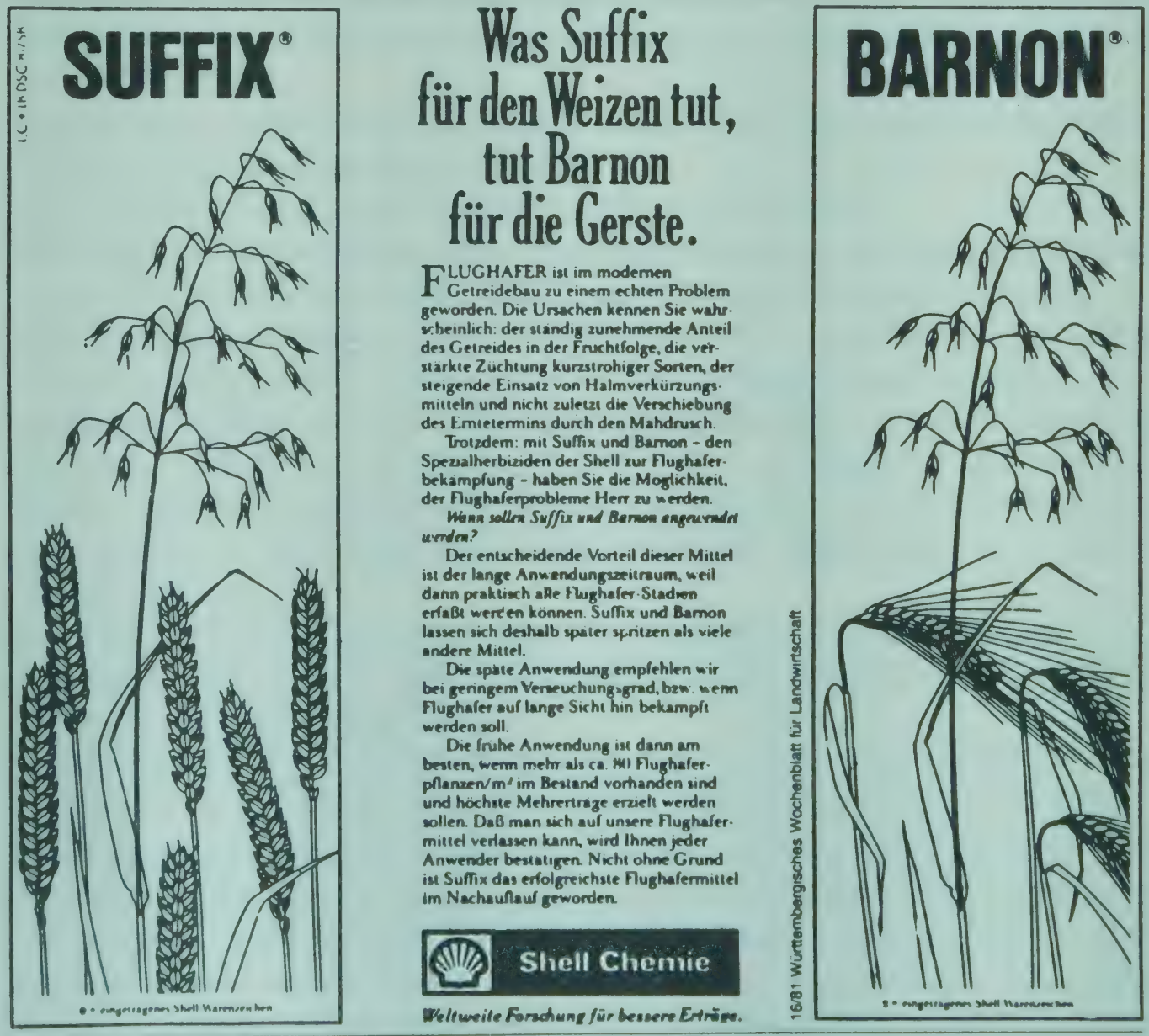
Another aspect of privatization relates to recognition by national laws of plant breeders' right. Patent rights over plant varieties, including microorganisms, have been devised in the North. In fact, the model is provided by the UPOV an International Union for the Protection of New Varieties of Plants, 1961. This Convention has been ratified by many countries in the North. We all need to study in the South an appropriate legal framework (ALF) to match our espousal of AST. Many alternative models of ALF exist.

Excerpts from 'An Open Letter to Non-Governmental Organisations (NGO) and Non-Governmental Individuals (NGI) on the 'Problem of Plant Genetic Resources' by Upendra Baxi and Clarence Dias.

SEEDS AND CHEMICALS

Seed coating and seed pelleting are becoming a standard practice in many major crops. In the case of seed pelleting, the primary objective is to make seed a uniform size for seed drilling. Increasingly, fungicides and plant growth regulators are added to the passive clay-base of the pellet in order to give the seed a 'head start' in the field. On the heels of seed pellets have come seed 'coats' or 'dressed' seed. The purpose is strictly to 'safen' the new plant against unwelcome intruders in the soil. In 1983, for example, it is even possible to buy fluorescent maize seed (allowing farmers to plant at night under the glow of their own seed) wrapped in a swarm of special chemicals protecting it from everything from rot to weeds.

For farmers, the advantages can be considerable — if they want the chemicals in the first place. Theoretically, farmers can reduce chemical costs and be more efficient with what they do use. At least 'obvious' environmental and health risks are reduced since there is no spraying. Those with less confidence in the


SUFFIX®
Was Suffix
für den Weizen tut,
tut Barnon
für die Gerste.
FLUGHAFER ist im modernen Getreidebau zu einem echten Problem geworden. Die Ursachen kennen Sie wahrscheinlich: der ständig zunehmende Anteil des Getreides in der Fruchtfolge, die verstärkte Züchtung kurzstrohiger Sorten, der steigende Einsatz von Halmverkürzungsmitteln und nicht zuletzt die Verschiebung des Erntetermins durch den Mähdrusch.
Trotzdem: mit Suffix und Barnon – den Spezialherbiziden der Shell zur Flughaferbekämpfung – haben Sie die Möglichkeit, der Flughaferprobleme Herr zu werden.
Wann sollen Suffix und Barnon angewendet werden?
Der entscheidende Vorteil dieser Mittel ist der lange Anwendungszeitraum, weil dann praktisch alle Flughafer-Stadien erfaßt werden können. Suffix und Barnon lassen sich deshalb später spritzen als viele andere Mittel.
Die späte Anwendung empfehlen wir bei geringem Verseuchungsgrad, bzw. wenn Flughafer auf lange Sicht hin bekämpft werden soll.
Die frühe Anwendung ist dann am besten, wenn mehr als ca. 80 Flughaferpflanzen/m² im Bestand vorhanden sind und höchste Mehrerträge erzielt werden sollen. Daß man sich auf unsere Flughafermittel verlassen kann, wird Ihnen jeder Anwender bestätigen. Nicht ohne Grund ist Suffix das erfolgreichste Flughafermittel im Nachauflauf geworden.
Shell Chemie
Weltweite Forschung für bessere Erträge.
16/81 Württembergisches Wochenblatt für Landwirtschaft
BARNON®

The Shell game

transnationals, however, might suspect them of using this method to increase the use of their chemicals and to force farmers into a system where they must have chemically-wrapped seeds.

The opportunity for advertising packages has also proven irresistible. In the United Kingdom, Shell is not only the largest private breeder of cereal varieties but it is also a major marketer of proprietary pesticides for cereals. Beginning in the 1980's, Shell has developed information booklets accompanying the purchase of its proprietary seed advising the buyer of the various chemicals that may be used with the seed. Exact details on rates of use and timing are provided. It should be pointed out that Shell does refer to the products of other companies — but it must be also added that its competitors are not thrilled with Shell's strategy.

In Germany, Shell has gone the direct route. Where once it advertised its maize varieties separately from its maize herbicides, it now combines the two products in the same advertisement.

Excerpts from Pat Roy Mooney, 'The Law of the Seed,' in Development Dialogue, 1983: 1-2, pp. 126-127.

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ABBREVIATIONS

AST – Appropriate seed technology
BADC – Bangladesh Agricultural Development Corporation
BARI – Bangladesh Agricultural Research Institute
BRRI – Bangladesh Rice Research Institute
CIMMYT – International Maize and Wheat Improvement Centre
DOA – Department of Agriculture
EEC – European Economic Community
FAO – Food and Agriculture Organisation
FELCRA – Federal Land Consolidation and Rehabilitation Authority
FELDA – Federal Land Development Authority
GNP – Gross National Product
HYV – High Yielding Varieties
IARCs - International Agricultural Research Centres
IBPGR – International Board for Plant Genetic Resources
ICDA – International Coalition for Development Action
IRRI – International Rice Research Institute
LPN – National Padi and Rice Authority of Malaysia
MARDI – Malaysian Agricultural Research and Development Institute
PBR – Plant Breeders Rights
PGR – Plant Genetic Resources
PORIM – Palm Oil Research Institute Malaysia
RISDA – Rubber Industry Smallholders Development Authority
RRI – Rubber Research Institute Malaysia
SAM – Sahabat Alam Malaysia
TMP – Third Malaysia Plan
TNC – Transnational Corporations
UNDP – United Nations Development Programme
UPOV – International Union for the Protection of New Varieties

Sahabat Alam Malaysia
(FOE Malaysia)
37, Lorong Birch, Penang,
Malaysia.

‘This is a report on one aspect of the "Green Revolution" or the process of scientific and technological development in the Third World's agriculture which was begun almost two decades ago. The Green Revolution, as is now well-known, through a package of sophisticated irrigation and drainage facilities, chemical fertilizers and pesticides, high yield varieties of seeds (HYV's) and farm machinery, promised bountiful harvests of food crops and was touted as the answer to food shortages in the Third World.

More than that, governments viewed it as the "short-cut" solution to the problem of rural poverty, avoiding the conflictual path to rural development, implicit in radical calls to reform land, labour and capital. The official enthusiasm for Green Revolution projects was fanned by an alliance between two major groups. One consisted of First World agro-business interests, notably chemical, engineering, construction and pharmaceutical businesses, that knocked on the doors of the Third World's capitals looking for lucrative projects and quick profits. The other consisted of international development institutions headed by the World Bank which also saw in agricultural modernization the quick fix to the Third World's agricultural problems, besides themselves gaining great influence and prestige and waxing fat on the commissions from their organizations of the massive financial transfers required to influence Green Revolution projects.’

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